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O. P. BRYSCH, Editor

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1. MANAGEMENT

Gas Industry Expansion

Distribution Growth to Pace Gas Industry. D. Hale. *Am. Gas J. 185,* 20 (1958) Aug. (2 pp.)

Expenditures by the nation's gas distribution companies in the period of 1958-70 will contribute more than 41.8% of a total of more than $37.7 billion projected expenditure by all three segments of the gas industry. Approximately $15,786,000,000 will be spent by distribution companies in this 13-year period to provide facilities for serving more than 13,330,000 new customers. Projections are based on a recent study released by the A.G.A.'s Bureau of Statistics.

Gas Industry Management

Economics of Nationalisation and the Effect on Technical Planning. D. D. Melvin. *Gas T. 42,* 35 (1958) July (3 pp.)

In Scotland, gas sales have increased by 6%, the fall in domestic sales of 4½% having been offset by a rise of 10% in commercial and 27% in industrial sales. Problem of falling domestic consumption is partly caused by the gas industry itself, which has tended to allow domestic consumer to carry a greater proportion of increased costs than the industrial and commercial consumer.

Natural Gas Field Prices Are Rising. *Petrol. Week 7,* 13 (1958) Aug. 1.

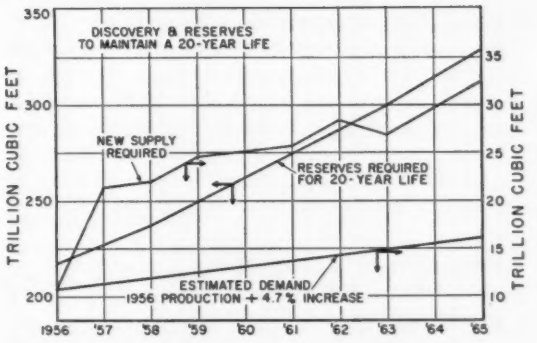
Growing demand for natural gas is continuing to exert a heavy upward pressure on prices. Transwestern Pipeline Co. is paying up to $0.23/MCF for an initial gas supply for its proposed line from West Texas and adjoining regions to the California border. Contracts with other firms have different terms; at least one contract specifies a price of $0.272 after 10 years.

Pipe: Its Control. H. E. Wade, J. A. Lauderdale, C. O. Ellis and H. M. Pendy. *Gas Age 122,* 22 (1958) July 10 (5 pp.)

Four experts conduct a symposium to discuss control of pipe from the standpoint of their respective company practices. Theme: pipe as an inventory item.

Production's Basic Problem: How to Get More from Men, Money, Materials. *Petrol. Week 7,* 40 (1958) July 18 (15 pp.)

Recession remedies are becoming standard operating procedures for many producers. Drive will be for even greater efficiency to find better uses for techniques now available and to develop new methods for the most economical operations. Budgets are being carefully scrutinized, state laws and regulations are being updated, application of new tools and techniques are being utilized in broader areas, remedial well work, fracturing and acidizing is being postponed by some, paperwork is being minimized, field electrification and automatic lease operations are being stepped up, labor saving steps are being carefully thought out and top management is carrying the cost picture directly to field personnel.



Data from *The Supply of Natural Gas . . .* (See abstract, p. 220)

Profitability of Capital Expenditures for Development Drilling and Producing Property Appraisal. J. J. Arps. *J. Petrol Tech. 10,* 13 (1958) July (8 pp.)

Appraisal of producing properties and profitability analysis of a proposed capital expenditure both are based on a projection of future cash income compared to one or more capital expenditures. "Average Annual Rate of Return" method computes in a simple manner the ratio of the present value of the future earnings after amortization to the present value of the undepreciated balances of the investment over the life of a project. This method appears to have some rather unique advantages in reducing the computation work required, eliminating trial-and-error solutions, and providing a more accurate answer when applied to oil industry investments subject to the unit-of-production basis of amortization.

Management's Use of Petroleum Engineering Evaluations. J. M. Houchin. *J. Petrol. Tech. 10,* 11 (1958) July (2 pp.)

Normally, management is confronted with more profitable investments than it has funds available. It is only through accurate engineering evaluations that management can determine which proposed investments will result in greatest company profit. Risk in leasehold and wildcat investments is being reduced appreciably by those managements who are looking at their engineering evaluations using comparative reservoir experience as well as the geological and geophysical justifications.

Pipeline Construction

New Yardstick for Gas Lines' Growth. *Petrol. Week 7,* 42 (1958) July 25.

American Gas Association estimates that natural gas transmission mileage will jump 65% during the next 12 years. By 1970, total mileage will reach 260,000. About $14-billion will have to be spent in order to accomplish this expansion of pipeline facilities.

Federal Power Commission

Give FPC Credit for Trying. R. S. Knappen. *Oil Gas J. 56,* 156 (1958) July 28 (6 pp.)

FPC is in serious trouble because it has been ordered to do things which, in its judgment and in the judgment of many students of the problem, are impossible. Suggested remedies: passage of Harris-O'Hara bill; sale of gas at its market price; recognition of favored-nations clauses as programs for selling gas at the market price; use of fixed price escalations where producer sells at a low price to encourage construction of a line or development of a market; easing of utility-type regulation and cessation of attempt to keep natural gas underpriced.

New FPC Commissioner. *Independent Petrol. Assoc. Monthly 29,* 17 (1958) July.

John B. Hussey, Shreveport, La., was named the 22nd commissioner to be sworn in as a member of the Federal Power Commission on June 23. He succeeds Seaborn L. Digby.

Petroleum Production

For Oil, the Threat Is Long Term. *Business Week 1508,* 80 (1958) July 26 (4 pp.)

Political events in the Middle East indicate that the UAR may eventually be transformed into an oil-producing power and not merely by the control of oil routes such as the Suez Canal and Syrian pipelines. Immediate threat is not critical; Iraq needs market outlets provided by major companies in the West. Real fear is possible spread of Iraqi revolt to entire Persian Gulf area. West would then face attempted takeover of Kuwait, trouble in Saudi Arabia and probable closing of Suez.

Petroleum Uses

Should It Really Be an Oil Era? G. Cellan-Jones. *Gas World 148,* 38 (1958) July 5 (3 pp.)

Aim of review is to indicate that while oil producers forge ahead in all foreign fields and effect price cutting in their progress, in Great Britain the industry must move cautiously and apply oil systems in moderation to maintain efficiencies and economies in each avenue of industry rather than attempt major application at the expense of coal which is still Britain's basic industry.

Petrochemicals

Can. J. Chem. Eng. 36, (1958) June; special issue, The Chemical Industry in Europe Today: Western Germany, K. Winnacker; United Kingdom, R. Holroyd; France, J. J. Desportes; Italy, G. Natta; Benelux, P. Ferrero; Russia, N. N. Melnikov.

Reconstruction of Europe's chemical research effort has been rapid and effective. Chemical exports from Europe are increasing annually; currently they constitute about 25% of British and West German production, 33% of Italian and 50% of Benelux manufacture. Forthcoming common market and free trade area of Continental Europe, expansion of the European chemical industry and its increased export sales are of great importance to chemical industry of North America. Special issue reviews manufacture, export, technical processes, shortages, growth and future plans of the European chemical industry, and indicates its effect on world market.

Polyethylene Fights Overcapacity. *Petrol. Week 7,* 34 (1958) July 25 (2 pp.)

Polyethylene production is outpacing market demand. Estimates for 1958 point toward productive capacity of 310-million lb with sales of only 30-million lb. Slow market acceptance and intense competition are behind the overflow.

The Development of the Petroleum Chemical Industry in Britain. R. Holroyd. *Chem. & Ind.* 901 (1958) July 19 (9 pp.)

Review of petroleum chemical industry begins with Castner's work and includes important milestones to date. Production techniques and figures also are presented.

The Billingham Enterprise. E. A. Blench. Part 1. *Chem. & Ind.* 926 (1958) July 26 (8 pp.); Part 2. *Ibid.,* 960, Aug. 2 (9 pp.).

Billingham, now an 1100-acre factory of over 2½-million tons of 80 different chemicals with a labor force of 17,000, was initiated by the government in 1917 as a nitrogen fixation plant. Development of the plant, with its ramifications into explosives, fertilizers, urea, hydrogenated coal and oil, plastics and methanol production, is described.

Mexico—Chemical Surprise. J. Sperling. *Chem. Eng. News 36,* 54 (1958) Aug. 4 (6 pp.)

Chemical industry in Mexico is represented by about 800 companies of various sizes, with a total investment of $224 million; it employs 25,000, and its annual sales amount to about $160 million. About 90% of Mexico's energy is derived from petroleum. Recent important development: recovery of natural gas. Three absorption plants have total capacity of 850 million CF/day. Reserves are estimated at 7 trillion CF.

French Petrochemicals Look to the Future. A. Loizillon. *Chem. Processing 21,* 99 (1958) Aug. (3 pp.)

Comparative production projections (1956 vs 1961) indicate that in France ethylene will go from 22,500 to 119,000 tons; synthetic rubber, 70,000 tons as against none in 1956; carbon black 35,000 tons as against none in 1956; plastics production will go from 128,000 to 335,000 tons and sulfur will reach a tonnage of 1,200,000 as against 60,000 in 1956, placing France in second place as world producer of sulfur and leaving an exportable margin of about 700,000 tons.

Competition

An 'AGA' for Oil Heat. *Nat. Petrol. News 50,* 116 (1958) Aug.

Subcommittee of the API's fuel oil committee is studying what legal steps must be taken to reconstitute either Oil-Heat Institute or some other national association or to create a new institute that will become to the oil industry what the A.G.A. is to the gas industry. Further action is expected at the API November meeting.

Coming: OHI Seal of Approval. *Nat. Petrol. News 50,* 113 (1958) Aug. (2 pp.)

At recent Oil-Heat Institute meeting members favored a plan to certify all domestic oil heat installations. Label will not be pushed as a crash program. Officials first want to determine whether safety and performance code can be improved. Nationwide, full scale certified oil heat installation may be a year away.

Shale Oil

Shale, Tar Sands Get New Impetus. *Petrol. Week 7,* 11 (1958) Aug. 1 (2 pp.)

Middle East situation may spur new efforts in North America to tap oil potential now locked in vast shale and tar sand deposits. If political picture continues to darken, U. S. government may provide the incentive for a stepped-up domestic program. Middle East blockage may spur domestic shale.

Cost Accounting

Cut Costs with Cost Accounting. H. R. Buchtler and J. F. Dunn, Jr. *Petrol. Refiner 37,* 167 (1958) July (5 pp.)

"Cost center" accounting makes available information essential to economic operations instantly. Method can pinpoint budget overruns as well as operating efficiencies.

Major Cost Analysis Methods Yield Equivalent Answers. F. C. Jelen. *Chem. Eng. 65,* 116 (1958) July 28 (3 pp.)

"Exact" methods used for engineering cost comparison give equivalent comparisons because fundamentally they are present worth methods based on one of the following: present worth, rate of return, annual cost or capitalized cost. Article shows how these methods compare.

Pollution Control

Jurisdiction over Pollution. A. C. Stern and G. E. McCallum. *Chem. Processing 21,* 32 (1958) Aug. (5 pp.)

Two chiefs of the separate Water Pollution Control Program and Community Air Pollution Program describe the Federal government's philosophy and activities in pollution control, and the laws under which they operate.

Air Pollution Review 1956-7. K. Kay. *Ind. Eng. Chem. 50,* 1175 (1958) Aug. (6 pp.)

Period has been marked by greatly increased research activity in Europe, Russia and the U.S., on nature and levels of pollutants, reactions between pollutants, effect of pollution on health and control measures. Fallout from nuclear explosions has perplexed specialists and a voluminous literature has been built up. Pollution from engine exhausts and from industry has received special attention during the period reviewed. Bibliography cites 271 items.

Education

Does Your Employer Own Your Knowledge? *Chem. Eng. 65,* 127 (1958) July 28 (4 pp.)

Employees gain know-how on the job and all collective engineering experience and know-how represents an investment on the part of the employer. Knotty question: When employees accept new jobs, who is the legal owner of their knowledge? Some of the engineering know-how being used on the job today may not belong to the employee. Article tells how recent legal decisions will affect professional activities. Specific cases are cited.

Refinery Construction Manual. H. M. Noel. Part 1. Initial Considerations. *Petrol. Eng. 30,* C-11 (1958) June (3 pp.); Part 2. Engineering the New Refining Unit. *Ibid.,* C-21 (1958) July (3 pp.); Part 3. Economics Studies and Cost Estimates. *Ibid.,* C-20 (1958) Aug. (3 pp.)

First part points out considerations to be made in selecting, generally and specifically, a location for a refinery and what its capacity should be. Planning, estimation, scheduling, process and mechanical design, drafting and procurement are subjects discussed in Part 2. Examination of alternate schemes, process investigation and the definitive cost estimate are presented in the third part.

Maintenance

Reduce Your Maintenance Costs. G. C. Derrick. *Chem. Eng. 65,* 132 (1958) July 28 (4 pp.)

With progression of time, the maintenance-to-production ratio will assume continually higher values. Application of industrial engineering techniques and sound management principles can effect considerable cost savings. Eleven-point cost-cutting possibilities check list is included.

2. ENERGY SUPPLY AND ECONOMICS

Gas Reserves

The Supply of Natural Gas: A Review. *Gas Age 122,* 13 (1958) July 10 (4 pp.)

Decline in drilling rates in the petroleum industry in 1957 and 1958, attributed primarily to the current oversupply of oil, are of equal importance to those interested in the present and prospective adequacy of natural gas reserves. Consequently, it becomes important to assess the trends in gas production and reserves. With annual consumption increasing, a constant finding ratio will require annual discoveries of absolutely increasing amount. Success rate of exploratory drilling has not been declining. Real cost of drilling also has decreased.

Three Basins Hold Spotlight in Wyoming Drilling Program. T. Dougherty. *Drilling 19,* 80 (1958) July (4 pp.)

New pipeline outlets, important oil discoveries and a reevaluation of the merit of gas reserves spark activity increases in the Green River, Powder River and Wind River basins. State's discovery ratio during 1957: 13.5%.

French Push Gas Project. *Oil Gas J. 56,* 122 (1958) July 28.

French are making good progress on a $250-million program to develop the vast Lacq gas field and build the processing and pipeline facilities to exploit the 7-trillion CF reserve. By 1961, Lacq should produce 700,000 MCF/day of raw gas, 8200 bbl/day of LPG and 6900 bbl/day of natural gasoline.

Petroleum Development

Argentina Is Going All Out to Develop Oil Reserves. *Oil Gas J. 56,* 70 (1958) Aug. 4 (3 pp.)

Foreign firms are being invited to make drilling and pipeline deals, although no concessions will be awarded. Two contracts have already been signed: Carl M. Loeb, Rhoades & Co., New York investment banking firm, and Pan American International (Indiana Standard).

Petroleum Production

The Competition Gets Hot in Overseas Oil Equipment. *Petrol. Week 7,* 48 (1958) Aug. 1 (11 pp.)

Equipment picture looks good for U. S. oil men overseas. Survey shows equipment supply to be ample in almost all lines, and prices will be rising only against heavy pressure. Big reason: loose condition of worldwide oil supplies. But increased activity for foreign manufacturers has heightened competition.

Midyear Report. *Oil Gas J. 56,* 123 (1958) July 28 (32 pp.)

Review and forecast indicate that: 25,961 wells will be scheduled for last half (completions will be up 2973 wells over first half—611 wildcats and 2362 field wells); three provinces figure high in wildcat successes during the first six months—western Canada, Rocky Mountains and Oklahoma's Andarko basin; scheduled last-half drilling will bring total wells for the year to 48,949; total demand is expected to average 10,084,000 bbl/day for the coming winter quarter; crude took its biggest cut in the first half, down 1,034,000 bbl/day to average 6,459,000 bbl/day.

Total Oil Imports Still 50 Per Cent Above 1954 Ratio. *Independent Petrol. Assoc. Monthly 29,* 13 (1958) July (2 pp.)

Schedules filed with the Texas Railroad commission indicate total imports during the third quarter are expected to average 1,500,000 bbl/day. Biggest increase will be in petroleum products, which are expected to be 600,000 bbl/day, 50% more than the corresponding period for 1957 and more than 100% above the third quarter of 1954.

Petroleum Refining

France. G. Henry. *World Petrol. 29,* 80 (1958) July 15 (4 pp.)

Third Plan of Modernization concludes it is necessary to increase the refining capacity of metropolitan France to 42 million tons of crude per annum in 1961 from present 30 million. Article lists objectives which various commissions of the Plan have outlined in order to help France keep pace with the general scheme which is evolving for the development of European refining.

Mexico Develops Refining to Meet Growing Demand. C. L. Corcuera. *World Petrol. 29,* 70 (1958) July 15 (4 pp.)

Over the past 13 years, Mexico has invested $228 million in new refining and transportation facilities, more than doubling capacity. Article describes growth enjoyed by Petroloes Mexicanos which since 1946 has increased its output from 153,000 bbl/day to 322,000 bbl/day.

Refinery Expansion Plans in Latin America. B. Rikles. *World Petrol. 29,* 106 (1958) July 15 (4 pp.)

Modernization and expansion activity in Latin America is centered in the nations in which consumption is growing at the most rapid rates. Argentina, Brazil, Venezuela and Uruguay all have major projects under way.

Refinery Expansion in the Western World. A. L. Paget. *World Petrol. 29,* 74 (1958) July 15 (6 pp.)

Current plans in the Free World outside of North America include 43 projects for new refineries and 22 expansion programs. When completed, the 43 new refineries will have an approximate total throughput of 860,000 bbl/day. Most of the new capacity is proposed for areas of heavy consumption with little or no domestic crude production. Of the total of 142,925,000 tons/year of capacity, 128,595,000 is planned for consuming areas and only 14,330 for producing countries.

Petroleum Reserves

Evaluation of U.S. Oil Resources as of January 1, 1958. P. D. Torrey. *Producers Monthly 22,* 18 (1958) July (3 pp.)

Data are presented on the current (January 1) estimate of U. S. oil resources by the Interstate Oil Compact Commission, based on studies by authorities in the 23 producing states. Data include oil recoverable by fluid injection.

Fluid Injection Boosts U.S. Reserves. L. J. Logan. *World Oil 147,* 47 (1958) Aug. 1 (2 pp.)

Oil recoverable by fluid injection under present economic conditions amounts to 13.1 billion barrels, increasing by 42.8% the reserves of 30.6 billion barrels producible by primary recovery. These combined reserves of 43.7 billion barrels plus the 57.8 billion barrels already produced assure ultimate recovery of 101.5 billion barrels, or 32.8% of the 309.9 billion barrels originally in the reservoirs.

Shale Oil

Shale Oil Is Commercial Today. *Petrol. Week 7,* 72 (1958) July 18 (3 pp.)

Corporation and research institute claim that improved processing technique can make shale oil commercially competitive with natural crude. A $3-million semicommercial plant may be constructed to complete testing of technique.

Shale Oil Is Commercial in Sweden Now. *Petrol. Week 7,* 21 (1958) Aug. 8 (3 pp.)

Sweden has produced shale oil commercially since 1942 and is now testing underground electric heaters to vaporize oil shale hydrocarbons. During the fiscal year ended June 30, 1958, products made from oil shale included 250,000 bbl of finished gasoline; 500,000 bbl of domestic and industrial fuel oils; 6-million gal of propane and butane; 38,000 tons of sulfur; 24,000 tons of ammonia and 55,000 tons of quicklime.

Drilling

$1.175 Billion for Drilling-Producing Equipment and Services. *Petrol. Eng. 30,* B-122 (1958) July 15 (2 pp.)

The 1957 dollar value of products and services for the petroleum industry is 1,132,995,694, about 3.22% above the 1955 figure and approximately 18% above the 1954 figure. Present and unofficial estimates are that the final figure for 1957 will approximate $1,175,000,000 which would represent an increase of 7.3% over 1955.

Exploration

Statehood Spurs Alaska Oil Activity. *World Oil 147,* 49 (1958) Aug. 1 (2 pp.)

Alaska may soon become most active exploration area in the U.S. now that actual statehood is imminent. Reasons for this forecast: to date, 28 oil companies and several individuals have earmarked more than $100 million for exploration and development work. At least 17 companies now have parties working in the field.

Electricity

Heating with Electricity. *Coal-Heat 74,* 37 (1958) July.

Electric utility industry will be a potential market for an additional 375 million tons of coal annually with the acceptance of electric heating in 50 million homes. Industry leader predicts that a million homes will be heated by "coal by wire" by 1960 and 40% of all new homes built will be heated electrically by 1970.

Heat Pump

A Long Look at Electric Heating Competition. T. Hart. *Gas Age 122,* 20 (1958) Aug. 7 (2 pp.)

Electric industry is backing its heat pump to the hilt in its efforts to balance heavy summer cooling load by building a winter heating load. It will take top salesmanship and service to keep this competition out.

Space Heaters

Luxury Oil Heat, Low Cost Living. *Fueloil & Heat 17,* 82 (1958) Aug. (3 pp.)

Chicago public housing project is designed to use approximately 1,000,000 gal of fuel oil annually

under normal climatic conditions. Project is credited with being largest radiant heating installation of its type in the world.

Nuclear Energy

Productive Uses of Nuclear Energy. Report on Nuclear Energy and the U.S. Fuel Economy 1955-1980. P. D. Teitelbaum. (Washington, D. C.: National Planning Assoc. (1958) July.)

From his 1980 energy projections, the author finds that only 15-20% increase in delivered fuel price should be expected. Thus nuclear energy costs must be sharply reduced to be competitive, yet they will operate as a restraint on fuel prices. Other recent projections of nuclear electric power have probably overstated its magnitude in the energy economy of the next few decades. Non-electric power applications may make ultimately as important a contribution to the energy economy as nuclear electric power. Nuclear energy will have special regional significance where fuel prices are above the average. Separate sections of the report cover the aspects of energy in the national economy, prospective energy prices, projections of demand from 1955-1980, competition of nuclear energy, implications of projection on national growth, and energy policy. Ten appendices present detailed tabulated data of trends and projections. Natural gas consumption for 1980 is estimated at 18 trillion CF and 24.1% of total energy.

Thermonuclear Power and the Pinch Effect. J. E. Allen. *Endeavour 17,* 117 (1958) July (10 pp.)

Discussion of fusion process shows that fusion power probably will be obtained from a thermonuclear reaction. Extreme physical conditions that must be developed in a power-producing reactor are discussed, and the self-magnetic pinch effect is described. Instabilities that arise in pinched discharges are discussed and means used to combat them included. Outline is given of the methods that can be used to deliver energy to a pinched discharge together with possible ways of extracting energy.

Nuclear Reactors

What to Consider When Designing Piping for Nuclear Processes. W. R. Dunbar, W. K. Luckow and J. L. Shapiro. *Heating, Piping & Air Conditioning 30,* 107 (1958) Aug. (3 pp.)

Two basic considerations: 1) any pipe, heat exchanger, valve or tank which must carry reactor pool water must be capable of continuous contact with low conductivity, oxygen saturated water for long period with a very low rate of corrosion; 2) materials must be capable of withstanding large doses of gamma radiation without physical damage, thus precluding use of plastic pipe and those types of rubber liners which deteriorate upon exposure.

A Lesson in Fabricating Nuclear Parts. *Metal Progress 74,* 68 (1958) Aug. (7 pp.)

Fabricated reactor components are produced from zirconium alloys and hafnium using metalworking techniques developed for precision and to avoid contamination. Welding is in a dry box, heat treating is in a vacuum; forming is done hot. Surface treatment and testing methods also are special.

Water Supply

Some Recent Developments in the Economic Utilization and Purification of Water. E. L. Streatfield. *Chem. & Ind.* 841 (1958) July 5 (6 pp.)

Water conservation problem can be classified as 1) artificial replenishment from other sources; 2) return of as much water as possible from industry to the source, and 3) reuse or recirculation of water by industry. Paper considers number of new techniques in purification of water, including ion exchange processes, electrodialysis, distillation by solar radiation, high pressure boiler feed treatment and precipitation processes.

Electricity

Thermo-Electric Generator. K. C. Jordan (assigned to U.S.A. as represented by U.S. Atomic Energy Comm.) U.S. 2,844,639 (1958) July 22.

Thermoelectric generator is claimed comprising a central heat conducting container for receiving the heat source (polonium 210, strontium 90) surrounded by a band carrying the spaced hot junctions, and the whole surrounded by a cylindrical cage of conducting rods which form the serially connected cold junctions of a thermopile.

3. NATURAL GAS AND PETROLEUM PRODUCTION

Drilling

The Challenge in Oil Field Mechanical Development. T. A. Huber. *Petrol. Eng. 30,* B-22 (1958) July 15 (10 pp.)

New and revolutionary developments are needed in equipment and techniques to halt and turn the tide of ever-increasing drilling and production costs. Realistic sizing of all oil field equipment is a step in this direction. Also needed: radical reductions in drilling rig size, greater drilling rig portability and additional improvements in completion techniques, workovers and multiple completions.

Unusual Type Drilling in Northern Illinois. B. Farson. *Drilling 19,* 74 (1958) July (2 pp.); **Turbodrills Competing.** *Oil Gas J. 56,* 108 (1958) July 28

(2 pp.); **Turbodrill Scores in Test.** *Petrol. Week 7,* 28 (1958) Aug. 1 (2 pp.)

Turbodrill undergoes thorough field tests at a gas injection storage project 10 miles from the nearest supply store, 200 miles from nearest bit supply and 230 miles from the nearest mud engineer. Comparative tests of two methods in identical strata in 10-well program showed turbo drill completed wells in one-third time, cut time on bottom from 111 hours to about 25, slashed, by 81.25%, total time needed to drill from surface to 1440 ft and set two strings of casing, and eliminated twistoffs.

Drilling Mud

High Density Muds Need High Quality Barite. R. R. Lewis. *Drilling 19,* 96 (1958) July.

Improved materials and advanced technology make possible the successful use of high density muds to meet the routine drilling needs of the Middle East, particularly Saudi Arabia and Iran.

Inverted Emulsion Mud Cuts Drilling Costs. R. M. Waltman and T. F. Cox. *Petrol. Eng. 30,* B-42 (1958) Aug. (5 pp.)

Use of inverted emulsion drilling mud in four 3500-ft wells in Saskatchewan saline formations reduced drilling costs from $19,125 to $11,608/well. Inverted technique means that minute water droplets are dispersed in a continuous oil phase. Oil becomes the "external phase" and water the "internal phase". This is a "water-in-oil" emulsion.

Exploration

Eastern Kentucky—A New Look at an Old Area. R. E. Greenfield. *Oil Gas J. 56,* 155 (1958) Aug. 11 (3 pp.)

Fresh oil finds give Kentucky a good oil-producing potential—and area has built-in gas future owing to proximity to eastern industrial markets.

Explorers Seek Oriskany Gas. *Oil Gas J. 56,* 270 (1958) July 28 (2 pp.)

Recent activities in the Empire state includes drilling of 18 wells in the Oriskany gas area, with six wells completed as producers. Two of the wildcat wells are significant as they may indicate the discovery of two new gas pools. There were 491 oil field development wells drilled during 1957, and the daily average for pipeline runs amounted to 7294.4 bbl.

How Successful Is Gas Exploration? F. H. Lahee. *Oil Gas J. 56,* 97 (1958) Aug. 4 (3pp.)

Analysis of results of exploratory drilling for gas reserves. Gas exploration is as successful as oil exploration. Results indicate that only one new field wildcat out of every 10.78 exploratory tests drilled found production. However, in recent years ratio of gas to oil discoveries has steadily mounted.

Oklahoma "Wilcox"—An Aid in Finding Deeper Structures. R. C. Tuttle. *World Oil 147,* 71 (1958) Aug. 1 (3 pp.)

Many tests in Oklahoma, which may have produced if drilled a few hundred feet deeper, have been abandoned because of poor correlation of the Wilcox sands of the Simpson group. Article summarizes various zones of this group and correlates finds to aid in providing better rock identification and to encourage search for deeper structures.

San Juan Basin Sparks Four Corners Buoyancy. J. C. McCaslin. *Oil Gas J. 56,* 131 (1958) Aug. 4.

Eighteen new discoveries in San Juan basin gave a 28% success ratio. Two main objectives featured in drilling—the Gallup and Dakota sands.

Wildcatters Set Hot Pace in Oklahoma. *Oil Gas J. 56,* 58 (1958) July 21 (3 pp.)

Significant discoveries have prevailed during the first six months of 1958 in Oklahoma. Exploration influenced by Anadarko, Central Ordovician, Ardmore and McAlester basins have spurred activities.

Geology

Subsurface Map: Underground Guide for Oilmen. L. Sebring, Jr. Part 1. *Oil Gas J. 56,* 186 (1958) July 7 (3 pp.); Part 2. *Ibid.,* 130 (1958) July 21 (4 pp.)

Selection of good mapping data should fulfill following conditions: reflect structure of prospective producing zones; occur over a wide area, a maximum number of wells should penetrate mapping horizon and geologist must be able to recognize and correlate it.

Reservoir Engineering

A Linear Programming Model for Scheduling Crude Oil Production. A. S. Lee and J. S. Aronofsky. *J. Petrol. Tech. 10,* 51 (1958) July (4 pp.)

Simple reservoir model is used to illustrate use of linear programming and this procedure then is applied to a production scheduling problem. Further illustration of the development and application of mathematical techniques for the solution of certain problems involved in economic "strategies".

Porosity Balance Verifies Water Saturation Determined from Logs. M. P. Tixier. *J. Petrol. Tech. 10,* 161 (1958) July (9 pp.)

In several log interpretation methods, water saturation is evaluated by use of ratio of readings of a short spacing resistivity device and a long spacing resistivity device plus data on the mud filtrate and

connate water resistivities. These methods are valid over a certain range of conditions.

Permeability Log Determination. S. T. Yuster and A. S. Odeh. *Petrol. Eng. 30,* B-36 (1958) Aug. (3 pp.)

Equation permits calculation of single phase liquid permeability as a function of depth, where porosity and saturation data are known.

Reservoir Rock Wettability—Its Significance and Evaluation. J. Bobek, C. C. Mattax and M. O. Denekas. *J. Petrol. Tech. 10,* 155 (1958) July (6 pp.)

Laboratory and field studies were conducted to examine and develop methods applicable to the measurement of rock wettability, to the investigation of factors which may alter the wettability of reservoir rock and to the determination of the wettability of specific reservoirs. Wettability characteristics of six reservoirs were evaluated by tests performed in the field on fresh cores cut with brine or special water-base muds. Tests indicated that all six reservoirs are water wet; however, the degree differed from one reservoir to another.

A Test of Connate Water Mobility. F. J. Bagley and D. E. Menzie. *Producers Monthly 22,* 21 (1958) July (5 pp.)

Laboratory investigation to determine the degree of connate water mobility during water flooding of an oil reservoir indicated that the oil is displaced from the reservoir not by injected water but by connate water which is, apparently, swept through rock in a bank between the oil and the flood water.

Secondary Recovery

Recovering Oil by Fire Flooding. J. N. Breston. *Monitor 3,* 4 (1958) July-Aug. (4 pp.); **Texas Fireflood Solves Some Problems.** *Petrol. Week 7,* 22 (1958) July 18 (4 pp.)

Conventional secondary recovery methods leave significant quantities of oil behind (estimates are that 10-20 million bbl will be left behind in currently producing reservoirs). There are an estimated 15 billion bbl of heavy crude and tar oils which cannot be produced by any present oil recovery methods. General description of fire flooding operation with examples is given. This method can recover all the oil from a formation according to technologists.

Rich-gas Drive Yields High Recovery. *Oil Gas J. 56,* 80 (1958) Aug. 4 (6 pp.)

Engineering report on Humble Oil & Refining Co.'s enriched-gas-drive-recovery experiment in Zone 20B-07, Seeligson field, Texas. While results to date are encouraging, further evaluation is necessary to establish 1) effect of gravity segregation; 2) pattern efficiency that can be expected; 3) conformance that will occur in swept area and 4) volume of enriched gas to accomplish maximum recovery.

Well Practice

Gas Detector Is Valuable Tool for Wildcat Drilling. G. L. Anderson. *Drilling 19,* 98 (1958) July (2 pp.)

Gas detector indicates when the bit enters a pay zone; but further, it is a safety device which warns of approaching gaseous conditions, thus helping to prevent blowouts.

Gulf Puts System into Blowout-Preventer Testing. E. McGhee. *Oil Gas J. 56,* 95 (1958) Aug. 11 (3 pp.)

Chart indicates step-by-step procedure for testing blowout-prevention and casing-head equipment. It represents method to insure that this equipment is tested properly and at the right times. Test requires that 3000 psi be used on the 900-series preventers and 5000 psi be used on the 1500 series preventers.

An Improved High Pressure Squeeze Cementing Technique. P. J. Broussard and J. C. McNatt. *Drilling 19,* 100 (1958) July.

Low water loss additive (carboxymethyl hydroxyethyl cellulose) and an improved technique increase the squeeze cementing success ratio.

Know Your Mud Pump—It Can Save You Money. S. L. Collier. Part 1. *World Oil 147,* 100 (1958) July (5 pp.); Part 2. *Ibid., 81* (1958) Aug. 1 (4 pp.)

Data based on extensive research into pump operation reveal cost saving methods of mud pump operation. Part 1 describes main parts of pump system and explains theory of pump operation. In Part 2, friction losses, pressure loss and inertia are discussed.

Long Casing Strings Are Routine. E. McGhee. *Oil Gas J. 56,* 106 (1958) Aug. 11 (4 pp.); **Taking Fatigue, 'Bite' from High Test Drill Pipe.** *Petrol. Eng. 30,* B-27 (1958) Aug. (3 pp.)

Phillips Petroleum Co. has established another record by setting 22,919 ft of pipe in the 1 EE University well in Pecos County, Texas, and 23,000 ft in the 1A Montgomery in a little more than one month. Deep as they are, these are not yet production strings as drilling continues in one and will be resumed in the other.

The Right Cement for the Right Job. B. E. Morgan. *Oil Gas J. 56,* 77 (1958) July 21 (5 pp.)

Outline of physical and chemical requirements constituted specifically to cover those properties needed in the cementing of oil and gas wells. Also furnished: method of classifying and identifying

portland cements in terms related to their use in well cementing operations.

Well Stimulation

Newest Well Stimulation Technique. H. H. Mohaupt and H. A. Metzger. *Petrol. Eng. 30,* B-30 (1958) Aug. (5 pp.)

Controlled ignition of a wire line explosive charge creates high frequency vibrations which cause rock failure in a horizontal plane.

Secondary Recovery

Hydrocarbon Recovery Process. D. H. Clewell (assigned to Socony Mobil Oil Co.) U.S. 2,843,207 (1958) July 15.

In an in-situ combustion recovery process for hydrocarbons in subterranean formations, tritium gas is introduced as a monitor at the input well and the underground progress of the flame front is determined from the time required for appearance of tritium at outlet wells.

Shale Oil

Method for In-Situ Utilization of Fuels by Combustion. G. J. W. Salomonsson (assigned to Svenska Skofferolje Aktiebolaget.) U.S. 2,841,375 (1958) July 1.

Improved product yields and better control of advancing in-situ combustion is claimed for a system of three successive alignments of boreholes into the carbonaceous strata, the first line serving for injection of air or combustion-supporting gas, the second for removal of combustion products and the third for removal of valuable volatile products. The first two borehole systems provide an advancing hot body of rock which transfers heat for pyrolysis in the third (forward) zone. Suction applied at the second line of holes is used to control the advance of combustion.

4. GAS CONDITIONING AND LPG RECOVERY

Hydrogen Sulfide Removal

Desulphurization of Coke-oven Gas at Appleby-Frodingham. L. Reeve. *J. Inst. Fuel 31,* 319 (1958) July (7 pp.); *Gas J. 295,* 176 (1958) July 23 (7 pp.)

Tests on the absorption of H_2S in coke-oven gas by hot iron oxide, both in static and fluidized beds, led to the installation and testing of a large pilot plant dealing with approximately 2½ million CF of coke-oven gas/day using fluidized beds of hot oxide, the sulfided material being recycled through a regenerator in which the oxide is roasted at from 600°-800°C in a stream of air, and is then returned to the absorber. Details of construction and operation of this plant are given. The influence of desulfurized gas on the sulfur content of the steel produced in large open-hearth furnaces using this gas also is described.

Sulphate-Reducing Bacteria and the Gas Industry. T. A. Dick. *Gas J. 295,* 34 (1958) July 2 (4 pp.); **Declaring War Against Sulphate-Reducing Bacteria.** T A. Dick. *Gas World 148,* 170 (1958) July 26 (4 pp.)

Use of bacteria as catalysts in reducing sulfite, thiosulfite and tetrathionate as well as sulfate to sulfide. Reducing agent may be hydrogen itself or nascent hydrogen provided by iron in solution, or one or more of a variety of organic compounds, e.g., lactate, succinate or even alcohol. Also included is description of general experience on research in Britain with oxide boxes, water-sealed holders and additives such as chromium.

Washing Hydrogen Sulfide from Coke-Oven Gas Using De-acidified Concentrated Ammonia Water. G. Hoffmann. *Gas-u. Wasserfach 99,* 509 (1958) May 23 (6 pp. German text.)

By using a short contact time between gas and ammonia-water, it is possible to remove hydrogen sulfide from coke-oven gas. By increasing the NH_3 concentration of the washing solution, it is possible to increase the removal of H_2S and at the same time decrease the steam consumption and consequently lower the cost. The de-acidifying of the high concentrated solutions under pressure is outlined and hints are given on how to control corrosion caused by the high concentration of cyanides.

Organic Sulfur

Organic Sulphur in Town Gas. R. L. Greaves. *Gas World 148,* 162 (1958) July 26; **Report on the Removal from Gas of Organic Sulphur in Some Glass-Making Processes.** *Gas J. 295,* 185 (1958) July 26 (2 pp.)

Follow-up on the main topic discussed at the annual meeting of the Institution of Gas Engineers in May: sulfur in town gas and problems associated with its removal. (See *Gas Abstracts 14,* June, p. 169.) Several glass factories in the area of St. Helens have installed their own activated carbon and catalytic sulfur extraction plants. Desirability of removing organic sulfur for some processes in that industry prompted author's study.

Thiophene

Hydrogenation of Thiophene Compounds with Hydrogen and Carbon Monoxide and a Cobalt Catalyst. H. Greenfield, S. Metlin, M. Orchin and

I. Wender. *J. Organic Chem. 23,* 1054 (1958) July (3 pp.)

Thiophene can be reduced to thiolane and alkylthiophenes, 2-thenyl alcohol and 2-acetylthiophene can be reduced to the corresponding alkythiolanes at 180°-190° by using longer reaction times with excess synthesis gas and larger amounts of cobalt catalysts. Yields are high enough for the reaction to be of preparative interest. Hydrogenations probably are homogeneously catalyzed by cobalt carbonyl and/or cobalt hydrocarbonyl.

Hydrogen Sulfide Removal

Separation of Acid Gases from Coal Carbonization Gases. H. A. Gollmar. U.S. 2,842,423 (1958) July 8.

In a hot vacuum carbonate gas purification process, steam jet evacuators are used to provide vacuum and the resultant actifier vapors are used to indirectly heat absorbent solution to generate steam. This steam is directly contacted with fouled solution to liberate hydrogen sulfide. Steam jets reduce the tendency of the actifier vapors to form hard polymer deposits.

5. NATURAL GAS TRANSMISSION

Automation

Automatic Compressors. C. H. Vivian. *Compressed Air 63,* 10 (1958) July (5 pp.)

Northern Natural Gas Company has placed two, automatic 1320-hp gas engine-driven compressors in operation at its Hooper, Neb., station. Although oil-line stations have had automatic control for some time, it is a relatively recent development on gas lines. Firm anticipates worthwhile economies in automatic control.

Automating the Gas Transmission System. N. E. Armstrong. *Petrol. Eng. 30,* D-24 (1958) July 15 (3 pp.)

Many large companies are planning and installing today for the inevitable expansion they anticipate in semi-automatic and complete automatic control. Article briefly discusses design considerations, power availability, measurement and communications equipment and expansion toward full automation.

Design Criteria for Automating a Pipe Line. K. Kridner. *Pipe Line News 30,* 18 (1958) July (2 pp.)

In the gas transmission, oil transportation and oil production industries, status of automation varies. In the first, the features of automation have been incorporated extensively, while the second-named has approached an automated system. In the last-named industry, art of automation has been developed extensively with regard to lease automatic custody transfer units.

Communications

Designing Land-Mobile Radio Communication Systems. J. R. Neubauer. *Petrol. Eng. 30,* D-19 (1958) Aug. (4 pp.)

Discussion is centered around factors of noise and distortion and their effects upon the intelligibility of output. Included is a description of the methods of measurement to determine system operating criteria. Also presented is a discussion on determining minimum intelligibility that can be used effectively in communications.

Power Supply and Space Requirements for Mobile Radio Communications. W. C. Baylis. *Am. Gas J. 185,* 35 (1958) Aug. (3 pp.)

Proper planning of power supply and placement of components can increase operating efficiency and reduce maintenance costs for users of mobile radio equipment.

Radio Frequency Transmission Lines. L. A. Bondon. *Pipe Line News 30,* 43 (1958) July (4 pp.)

Primary problem associated with acceptance of surface wave transmission techniques was development of an efficient method for properly launching surface wave mode through a field transformer having as little loss as possible at each transition point. Report of one company's experiences over six-year period in determining how and where to recommend that surface wave techniques be safely used.

SSB and Similar Systems. R. P. Gifford. *Gas Age 122,* 23 (1958) Aug. 7 (6 pp.)

Wise allocation of the spectrum is an obvious public need. It will be important for gas utilities and other members of the Land Mobile Radio Services to keep the public well informed on their use of this natural resource, the services it can perform and the factors to be considered in allocating shares in the public interest.

Compressors

Conditioning Engine Inlet Air. O. H. Moore. *Gas Age 122,* 32 (1958) July 10.

With the development of high compression engine, the problem of detonation has been created. Problem requires control of combustion-air temperature.

Lean Fuel Mixture Ignition in Natural Gas Engines. W. E. Warner. *Pipe Line News 30,* 36 (1958) July (2 pp.)

Discussion of job ignition system must do to reach

perfection. Emphasis must be placed on spark consistency. In recent years, two systems have been developed that meet the requirements for lean mixture ignition. New design is radical departure from that of conventional equipment. Field collapse principle is discarded.

Use These Equations when Testing Centrifugal Compressors. F. C. Koenig. *Petrol. Eng. 30,* C-11 (1958) Aug. (5 pp.)

When air or substitute gases are used to test a gas compressor, it is often necessary to test at speeds other than design to obtain design density ratio through the compressor. To test any gas compressor on any given gas, an "equivalent speed" is selected so that density ratio on test would be the same as density ratio with design gas. In addition, Mach numbers in the blading and flow passages must agree with design values.

Pipeline Construction

Creole Lays Super-Inch Pipe. *Oil Gas J. 56,* 88 (1958) Aug. 11.

Construction has started in Lake Maracaibo on a 40-in. diam. pipe which is being laid in approximately 80 ft of water as part of an elaborate gathering system for Creole Petroleum Corp. In addition to nearly 14 miles of the 40-in. pipe, system will include several 16 and 30-in. lines.

Construction of the Trans Canada Pipe Line. H. D. Fowler. *Pipe Line News 30,* 20 (1958) July (6 pp.)

Brief outline of the history and progress of the Trans Canada Pipe Lines' system. Rapid increase in demand for natural gas by present consumer companies indicates that Trans Canada will have at the end of the third operating year a system which originally was expected to evolve at the end of the fifth operating year.

Power Shovels, Hoes, Cranes, Draglines and Clamshells. O. T. Zimmerman and I. Lavine. *Cost Eng. 3,* 68 (1958) July (17 pp.)

Costs are given for material-handling equipment along with a description of auxiliary equipment and some operational capacities.

Submarine Trenches. S. V. Collins and P. Reed. *Oil Gas J. 56,* 111 (1958) Aug. 11 (4 pp.)

Article describes nature of the equipment and operations of Collins Construction Co.'s patented submarine trenching machine with emphasis on jobs exemplifying what machine has accomplished, how equipment works and provisions for protection of divers, and policies followed for burying submarine lines to protect against damage by marine organisms.

Tunisia Approves Crude Line. *Oil Gas J. 56,* 120 (1958) July 28.

Two events in Tunisia have indicated that oil industry affairs are proceeding normally in the Arab world: 1) Tunisian government has approved an agreement with a French pipeline company and the country may get the nod as the route for a pipeline from the Edjele area of Algeria to the Mediterranean; 2) in another development, Tunisia awarded a 618-sq. mile concession to Rimrock International and an Italian company.

Using Hydraulic Triangles for Pipe Line Design. L. Hawkins and F. D. Edwards. *Pipe Line Ind. 9,* 28 (1958) Aug. (4 pp.)

First step in pipeline design is determination of line size and the number and location of booster stations. Review of graphic method of solving hydraulic problems based on hydraulic gradient triangles.

Pipeline Operations

50 Years in Pipelining — There've Been Some Changes Made. *Petrol. Week 7,* 38 (1958) Aug. 8 (2 pp.)

On the 50th anniversary of completion of its Glenn Pool-to-Port Arthur line, Texaco tells of the great pipeline race between its crew and that of the Gulf Oil Corp.

Land Surface Subsidence and Its Effect on Pipeline Systems. W. Johnson. *Gas Age 122,* 31 (1958) July 24 (12 pp.)

Background material on causes and effects of subsidence in relation to the experience of Standard Pacific Gas Line, Inc., and outline of steps taken to combat effects of subsidence in the Los Banos-Kettleman City area.

Tennessee Gas: Example in Integration. *Oil Gas J. 56,* 110 (1958) July 28 (2 pp.)

Best known as one of the world's largest pipeline companies Tennessee Gas Transmission Co. has, in the past decade expanded into one of the most diversified firms in the petroleum business. Latest acquisition: controlling interest in Middle States Petroleum Corp., which will give TGT a net increase in production of about 6519 bbl/day of oil, condensate and plant products, plus 46-60 MCF of natural gas/day.

TGT Taps Giant Offshore Reserves. *Oil Gas J. 56,* 114 (1958) July 28 (2 pp.)

Gas production off Louisiana will jump 40% this week as world's longest underwater line goes into full operation. Going price for CATC gas will be 22.4 cents, but contract is still a moot subject before FPC and the courts.

Pipeline Systems

The LPG Transportation Fight Heats Up. *Petrol. Week 7,* 39 (1958) Aug. 1 (3 pp.)

Texas Eastern Transmission Corp. plans to batch LPG with other products moving through the Little Inch system which now extends from the Houston area 1168 mi. to Moundsville, W. Va. Company will give top priority to extending the system for moving LPG to mid-Atlantic and New England marketing areas. Company also is making important additions to a key part of its existing LPG transmission system—the underground storage cavern at Todhunter, Ohio.

Telemetering

Telemetering in the U.S. H. H. Carlson. *Gas J. 295,* 25 (1958) July 2 (7 pp.)

Detailed review of automatic control systems in the American gas industry, with examples of how their application has greatly simplified the problem of maintaining adequate supply at points of heavy demand.

Welding

Magnetographic Control of Pipeline Butt Welds. A. S. Falkevich. *Gas 34,* 121 (1958) Aug. (3 pp.)

In 1954-55, a magnetographic method of control was developed at the USSR Oil Construction Research Institute. Method consists essentially in recording stray fields that arise at flaw spots in the magnetized welding zone on ferromagnetic tape and passing the latter through reproducing magnetic head.

Pipeline Construction

Pipeline Reclaimer. K. C. Knapp. U.S. 2,841,893 (1958) July 8.

Improved pipeline reclaiming machine is claimed, comprising a tractor-drawn earth-loosening plow, a reclaimer pulled along beneath the pipe to break it loose from embedment and an elevator-cradle to lift the loosened pipe to the surface and deposit it on the loosened earth.

6. GAS AND LPG STORAGE

Ethylene

Ethylene Storage and Distribution. Part 1. What's Involved in Ethylene Storage. H. C. Schutt and A. R. Mattioli. *Oil Gas J. 56,* 74 (1958) Aug. 4 (6 pp.)

Oil refining companies which produce ethylene have large-capacity installations. There are two general situations which distinguish the type and scope of storage facilities to be considered: 1) integrated chemical-manufacturing plant producing its own olefins and 2) large producer of olefins selling the product on demand to several chemical manufacturers. Design, arrangement of plant, installation types and costs and production schedules are outlined.

Storage Losses

Calculate Fuel Oil Storage Tank Heat Losses. K. M. Ritchie. *Petrol. Eng. 30,* C-42 (1958) Aug. (2 pp.)

By example author illustrates annual dollar savings for insulating a large bulk storage tank in a temperate zone climate. By covering this tank with 2-in. thick insulation blocks, as much as $72,255 in heating costs may be saved in a single year. Equations used for calculations are included.

Plastic Blankets: Low Cost Way to Cut Product Loss. *Nat. Petrol. News 50,* 104 (1958) Aug. (3 pp.); Holding Down Evaporation Losses. *Business Week 1511,* 51 (1958) Aug. 16.

Floating plastic blankets offer economical way to cut evaporation losses in storage tanks for crude oil, gasoline, other oil products and alcohols. Three conservation devices, made primarily for small-diameter tanks, are designed to cut vapor loss by 85-95%.

Underground Storage

Gas Storage Deliverability Boosted by Fracturing. A. B. Waters and H. J. Ayres. *Pipe Line Ind. 9,* 32 (1958) Aug. (6 pp.)

Underground gas storage field operators are finding the economics of hydraulic well fracturing of real interest. Higher deliverability often may postpone the need for drilling additional wells or adding a field to meet service demands. Most storage fields may be stimulated by fracturing through proper well selection and completion practices.

LPG

Apparatus for Dispensing Gas from a Container of Liquefied Gas. H. L. Johnston and C. L. Newton (assigned to H. L. Johnston, Inc.) U.S. 2,842,942 (1958) July 15.

Liquefied gases, such as oxygen, are dispensed in gaseous form without providing high ambient temperatures by using secondary external and internal heat exchange passes, to give two-stage transfer of heat to the liquid.

Storage

Vapor Recovery Turns Evaporation Loss into a Profit. R. E. Fields. *Oil Gas J. 56,* 73 (1958) July 21 (4 pp.)

Investment of $40,000 in a vapor recovery installation paid out in less than five months. System is an adjunct to centralized storage facilities recently installed in West Texas field.

7. MANUFACTURED GAS AND CHEMICAL PROCESSING

Butadiene

Neches Butane Products Co. Increases Butadiene Capacity. *World Petrol.* 29, 98 (1958) July 15.

Article indicates that new facilities going on stream at company's Gulf Coast plant will produce 100,000 short tons of butadiene annually, increasing capacity by 50%.

Carbon Disulfide

Production of Carbon Disulfide. H. N. Madon and R. F. Strickland-Constable. *Ind. Eng. Chem. 50,* 1189 (1958) Aug. (4 pp.)

Description of process based on the system carbon monoxide plus sulfur operating at 500°C. Sample of artificially prepared coal charcoal may be used as a substitute for beech charcoal. Coke might replace charcoal if used in pulverized form.

Catalysis

Heterogeneous Character of Hydroformylation Catalysis. C. L. Aldridge, E. V. Fasce and H. B. Jonassen. *J. Phys. Chem. 62,* 869 (1958) July (2 pp.)

Certain phenomena can best be explained by a heterogeneous mechanism, wherein cobalt in an insoluble form is essential. Insoluble cobalt may provide a fresh, highly active metal surface which is constantly being consumed and redeposited by carbonyl formation and breakdown. Data indicate that hydroformylation rate of an olefin is not directly dependent upon the amounts of soluble cobalt present under reaction conditions.

The Hydrogenation of Benzene over Copper-Nickel Alloys. W. K. Hall and P. H. Emmett. *J. Phys. Chem. 62,* 816 (1958) July (6 pp.)

Kinetic study of the hydrogenation of benzene over a series of alloys was conducted to provide data for critical tests of theories relating catalytic activity to properties of the solid state. Isothermal data obtained show a sharp decrease near the critical alloy composition of 60 atom % copper where the *d* band of the metal is just filled. Activation energy data obtained concomitantly showed that the observed changes in activity did not reflect changes in the activation energies but came about through overpowering "compensations" by the frequency factors.

Reactions of Freshly Formed Surfaces of Silica. R. E. Benson and J. E. Castle. *J. Phys. Chem. 62,* 840 (1958) July (4 pp.)

Rupture of silicon-to-oxygen bonds in silica has been shown to produce active sites that are capable of reacting with olefins and with alcohols. These reactions can be effected by grinding silica in the presence of organic liquids or by simple mixing of organic materials with silica that has been ground and stored in an inert atmosphere. Probable mechanism for these reactions is presented.

Coal

Thermal Decomposition of Coal in High Vacuum. B. Sun, C. H. Ruof and H. C. Howard. *Fuel 37,* 299 (1958) July (10 pp.)

All-steel molecular distillation apparatus was used to study primary thermal decomposition of coal products. Decomposition of four coals differing widely in rank has shown that the distillate from the coal with the strongest agglutinating properties is richest in high molecular weight components. With the Pittsburgh bed coal nearly 50% of the material distilled at 550°C is so high in molecular weight that it remains on a water cooled condenser at a pressure of about 1 micron. The lignite sample gave a higher yield of condensate than the low volatile, bituminous coal, but the fraction of high molecular weight components in the total volatile matter from the former was very small.

Ethylene

GAF Backs Air-Oxidation for Ethylene Oxide. *Chem. Eng. 65,* 100 (1958) July 28 (4 pp.)

Amid a mounting controversy on the relative merits of air and oxygen for oxidizing ethylene, General Aniline's Linden, N. J., plant is continuing to use air as the oxidizer.

Ore Reduction

The Reduction of Iron Ores with Oil Products. L. Weber. *Erdöl u. Kohle 11,* 241 (1958) Apr. (4 pp. German text.)

In order to meet the demand for coke by the growing steel production, oil and its derivatives are suggested as a substitute. Crude iron production as an intermediate product for steel will be replaced by iron sponge. New markets will open for the oil industry and the growth of the steel industry will not be hampered by the shortage of coke.

Organic Sulfur

The Removal of Organic Sulphur Compounds. J. G. King. *Gas T. 42,* 25 (1958) July (2 pp.)

Descriptions of the North Thames Gas Board, gas scrubbing by active carbon and Appleby-Frodingham processes are presented to serve as reminders that these preceded the Holmes-Maxted process. In some operations one of these earlier processes may be more applicable.

Petrochemicals

The Production of Vinyl Chloride from Oil-Hydrocarbons. K. J. Kosterhon. *Erdöl u. Kohle 11,* 390 (1958) June (4 pp. German text.)

Outline of method for production of vinyl-chloride from ethylene and of the production of ethylene by hydrocarbon cracking. Effect of cracking conditions on ethylene yield and its refining after the cracking process are described.

Thermo Data for Petrochemicals. K. A. Kobe and H. R. Crawford. Part 24. Heats and Free Energies of Formation for 47 Compounds. *Petrol. Refiner 37,* 125 (1958) July (6 pp.)

Enthalpy and free energy functions are tabulated for 47 compounds from 273°-1500°K. These data are needed to determine the feasibility of a reaction, the heat load on the reactor and the equilibrium yield of a desired product.

Petroleum Refining

Advances in Petroleum Chemistry and Refining. Vol. I. Edited by K. A. Kobe and J. J. McKetta, Jr. New York: Interscience Publishers, Inc., 1958.

First in a series, this volume presents critical evaluations of new developments in the petroleum refining and petrochemical industries. Description of dynamic growth and diversified products of these industries necessitates a breakdown into both research and engineering aspects of a great number of processes. This is accomplished in five main sections: economics and trends, unit operations and design, refining processes, petrochemicals and mechanical equipment. Leading authorities present detailed current reports on particular subjects; e.g., R. J. Gonzales who opens the volume with a chapter on the economics of petroleum operations. Other chapters in the first section deal with origin, recovery and composition and trends on all fuels with special emphasis on automotive fuels and new requirements. Section on unit operations consists of three chapters, each covering a particular separation or purification method. The first, on crystallization, presents the theory, applications in the industry for lube oil dewaxing, xylene separation and wax manufacture as well as process set-up and equipment. Extractive and adductive crystallization are treated. The operations chapter gives a similar detailed description of superfractionation and azeotropic and extractive distillation, with examples and calculations for typical difficult separation. Next chapter presents descriptions and operating characteristics of various new designs of fractionating trays. Chapter 7, which heads the refining process section, deals with the alkylation of paraffins chiefly from the chemistry viewpoint. Catalysts, feed materials, reactions and the importance of the alkylate products in modern aviation fuels are treated. Catalytic reforming, or naphthene dehydrogenation to aromatics, isomerization of paraffins and dehydrocyclization of paraffins are next discussed with their catalysts, mechanisms, feedstocks and yields in terms of octane number. Equally thorough treatment is given to solvent refining, with its numerous methods for separation of aromatics, lubricating fractions, wax and asphalt, as well as new types of contacting and extracting apparatus. In the petrochemicals section, Esso Research specialists author the essay on the oxo process, its mechanism, plants and commercially important alcohol, aldehyde and olefin products. Chapter 11 discusses production of the new unique solid polymers of specific structures such as polyethylenes, polypropylenes and polydiolefins, and treats the catalysts, mechanisms and properties and uses of the polymers. The final chapter presents developments in engineering and fuels as applied to the automotive engines, including spark ignition, Diesel and gas turbines.

Producer Gas

Producers and Power. H. Dobson. *Gas World 148,* 122 (1958) July 19 (7 pp.)

Description concerning the operation of Denton Works, North Western Gas Board, deals briefly with the producers, distribution of steam and power and the arguments for and against augmentation. Unusual features of operation are Wellman-Galusha Producer Plant and the absence of steam prime movers with the exception of boiler feed pumps and steam turbines.

Rocket Fuels

Nitromethane. Physical Properties, Thermodynamics, Kinetics of Decomposition and Utilization as Fuel. A. Makovky and L. Lenji. *Chem. Rev. 58,* 627 (1958) Aug. (18 pp.)

Use of nitromethane as a liquid monopropellant in rocket motors presents the following problems: 1) positive ignition of nitromethane; 2) explosion hazards (especially in the cooling ducts of regeneratively cooled motors); 3) the high chamber pressure needed to sustain combustion. Other properties and characteristics mentioned in title also are discussed.

Sulfur Dioxide

Absorption of Sulfur Dioxide from Air. Oxidation in Drops Containing Catalysts. H. F. Johnstone and D. R. Coughanowr. *Ind. Eng. Chem. 50,* 1169 (1958) Aug. (4 pp.)

Droplets of sulfuric acid formed by absorption of sulfur dioxide and oxygen from air by fog droplets nucleated by oxidiation catalysts may be important in air pollution. Rates of acid formation were measured when dilute drops of manganese, iron, copper

and nickel sulfates were exposed to air containing sulfur dioxide. In addition, a mathematical analysis was developed for the steady-state absorption of sulfur dioxide by drops of catalyst solutions.

Water

Corrosion and Water Treatment. G. G. Sindery. *Corrosion Tech. 5,* 209 (1958) July (5 pp.)

Inhibition of corrosion is a specialized division of the science of water treatment. Necessity for treatment of industrial waters for prevention of scale deposits and to adjust dissolved constituents to suit a particular manufacturing process is recognized, but conditioning of pretreated water to prevent corrosion is often not considered except superficially. Article discusses proved corrosion inhibitors and the new materials becoming available, particularly those in the field of organic inhibitors.

Water Treatment for Domestic Hot-water Supplies. C. C. Hanson. *Corroson Tech. 5,* 220 (1958) July (5 pp.)

Corrosion and deposition problems arising from either hard or soft supply waters become of increased importance when the water is heated. Article describes nature of scale formation, corrosion of iron pipes and use of sodium hexametaphosphate as a means for minimizing trouble.

Acetylene

Self-Sustaining Regenerative Process. R. L. Hasche. U.S. 2,844,452 (1958) July 22.

Continuous regenerative process for producing acetylene and olefins from hydrocarbon comprises passing a non-flammable first mixture of hydrocarbon and oxygen through a first refractory regenerator, thereby effecting incipient thermal alteration of first mixture into a flammable second gas mixture, which, in a combustion zone, completes the simultaneous endothermic reaction, yielding a hotter third gas mixture which is quenched in a second refractory regenerator with periodical reversal of direction of gas flow.

Coal Carbonization

Fluidized Carbonization. G. T. Skaperdas (assigned to M. W. Kellogg Co.) U.S. 2,841,534 (1958) July 1.

In a process for carbonization or gasification of carbonaceous solids, the feed solids are dried in a high-density fluidized bed by an indirect heat exchanger tube chest heated by fluidized oxidation of fuel gas. Moisture, volatiles and dust from the dryer are removed by an oil scrubbed quench zone, with the recovered slurry cooled and recirculated.

Carbon Dioxide

Method for Purification of Carbon Dioxide. A. G. Eickmeyer and W. W. Deschner (assigned to J. F. Pritchard & Co.) U.S. 2,842,941 (1958) July 15.

Inert gas admixed with carbon dioxide gas is first cooled by primary condensation with inerts separation then flashing the liquid into a lower temperature stripping zone with passage of some condensate through a reboiler to provide stripping vapors and collecting purified liquid carbon dioxide from reboiling zone.

Liquefaction

Method of Separating Gaseous Mixtures. W. E. Lobo and G. T. Skaperdas (assigned to the M. W. Kellogg Co.) U.S. 2,840,994 (1958) July 1.

In fractionation of air by liquefaction, an improved method is claimed for removing water and carbon dioxide from incoming compressed air which comprises precipitating the impurities completely by heat exchange with a portion of product nitrogen, but using an additional warmer product gas exchange for the clearing of the exchange zone during reversal.

Synthesis Gas

Apparatus for Partial Combustion of Gasiform Hydrocarbons. J. H. Arnold (assigned to Hydrocarbon Research, Inc.) U.S. 2,840,149 (1958) June 24.

In the production of synthesis gas by partial combustion of natural gas with oxygen, an improved burner is claimed in which the oxygen is fed through a central tube and the gas through an outer annular channel. Each enters a combustion chamber through multiple ports positioned so that entering fuel streams impinge at a 45°-90° angle upon the oxygen streams at 200 ft/sec to insure maximum mixing and reaction.

Synthesis Gas Manufacture. N. M. Kapp and F. W. Sullivan, III (assigned to Houdry Process Corp.) U.S. 2,844,453 (1958) July 22.

Synthesis gas is produced by passing preheated methane through a reaction zone at 1400°-2000°F into contact with a recirculating molten heat transfer agent (alkali metal chlorides or metals such as antimony, bismuth lead or tin) containing reducible metal oxide or carbonate donor material, with the reduced donor regenerated by air or flue gas in a separate heating zone.

8. GAS DISTRIBUTION

Distribution Systems

The Gas Supply for Pacific Lighting System. J. F. Ebdon. *Gas 34,* 107 (1958) Aug. (11 pp.)

In 1957, total sendout for system was about 535

billion CF. Of this, 116,718 MMCF was purchased from California producers; 331,630 was purchased from El Paso Natural Gas Co., and the remainder was received from underground storage and exchange.

The Pacific Lighting System. J. F. Ebdon. *Gas 34,* 49 (1958) Aug. (17 pp.)

History of Pacific Lighting System indicates that: company delivers natural gas to 2,255,307 customers (rate of growth over past decade—91,000 active meters annually); that distribution subsidiaries of the corporation comprise 21,500 miles of distribution main; in 1957, total sendout was 535.2 billion CF of gas with a peak day of 1.977 billion. Pacific Lighting Corporation is parent company to Southern California Gas Co., South Counties Gas Co. of California and Pacific Lighting Gas Supply Co., servicing 14 of 15 counties that comprise Southern California.

Leakage

Experiences with Bell and Spigot Joints Sealed by the Fuelling Method. C. P. Xenis. *Am. Gas J. 185,* 22 (1958) Aug. (3 pp.)

Two operations are necessary to successfully seal bell and spigot joints by the Fuelling method—cleaning and coating. Each operation is performed by a different machine, both incorporating a magnetic locating device to find joints inside of a gas main.

Pushmobile Leak Detector Devised by BU. *Gas Age 122,* 13 (1958) Aug. 7 (2 pp.)

Infrared detector installed on pushcart-type trailer simplifies sidewalk inspection for house service leaks in Brooklyn.

Pressure Regulation

Can You Afford to be Without Two-Stage Pressure Regulation? G. R. Postlewait. *Butane-Propane News 20,* 30 (1958) Aug. (6 pp.)

Author uses case histories to prove his point that two-stage regulation does have application in competitive areas and that its proper use will result in less service calls, higher operating efficiency, more flexible gas systems, less unaccounted for gas, better satisfied customers and longer profits.

Economics and Safety in Gas Distribution. F. H. Mueller. *Am. Gas J. 185,* 25 (1958) Aug. (6 pp.)

Pressure increase from relatively low values to those used by many companies today has been an economic solution to the major gas distribution problem, but it intensifies leakage and safety problems. On the brighter side: improvements in pipe and pipe joints, development in corrosion prevention and development within gas companies themselves of safety divisions and of standard practices and procedures.

Pressure Regulation

Apparatus for Recovering Gases from Flare Lines. W. B. Polk (assigned to Phillips Petrol. Co.) U.S. 2,844,160 (1958) July 22.

Improved regulating device which permits recovery of valuable gases from a relief or flare line consists of a low-pressure loop with pressure setting to return gases continuously to a compressor, and a high-pressure bypass with a regulator or water seal to protect the system against high-pressure surges.

9. GAS FUEL UTILIZATION AND APPLIANCES

Air Conditioning

Unusual Structural Layout Demands Unique Air Conditioning Design. *Heating, Piping & Air Conditioning 30,* 98 (1958) Aug. (2 pp.)

Peripheral zones, interior zones will be conditioned the year around by high-velocity induction systems, respectively, in new Chase Manhattan building, New York. Refrigeration equipment is to be located in two rooms with about equal cooling capacity to serve upper, lower portions of edifice. Absence of interior structural columns posed problem as to where to put ductwork, piping. These will be run through holes in steel beams.

Air Pollution

Air Pollution and the Gas Industry. F. R. Rehm. *Gas Age 122,* (1958) Aug. 7 (5 pp.)

Author reports on air pollution problem in Milwaukee by means of discussion and four tables. One table, which spans a 7-year period, indicates that most appreciable inroads into reducing total particulate deposition pollution problem have been made in industrial zones. Data summarized in this table represent the largest and most complete deposition-rate study programs conducted anywhere in the country.

Experiments on an Industrial Venturi Scrubber. J. A. Brink, Jr. and C. E. Contant. *Ind. Eng. Chem. 50,* 1157 (1958) Aug. (4 pp.)

In a statistically designed experiment, the collection efficiency of an industrial Venturi scrubber on phosphoric acid mist was measured. Variables studied included gas velocity, liquid rate, liquid injection velocity and number of injection orifices. Collection was correlated with these variables. Pressure drop across the Venturi scrubber was correlated with the operating variables.

Photochemical Formation of Air Contaminants from Automobile Exhaust Vapors. Effects of Different Motor Fuels. P. P. Mader, J. Gliksman, M. Eye and L. A. Chambers. *Ind. Eng. Chem. 50,* 1173 (1958) Aug. (4 pp.)

Under controlled experimental conditions maintained during comparison of two fuel blends, the composition of exhaust gases and their capabilities for participation in photochemical reactions resulting in smog were shown to be dependent on make-up of the charging fuel—specifically, amounts and types of olefins in the fuel blend.

Reaction of Nitric Oxide with Activated Carbon and Hydrogen. G. Bedjai, H. K. Orbach and F. C. Risenfeld. *Ind. Eng. Chem. 50,* 1165 (1958) Aug. (4 pp.)

Investigation was undertaken as a primary step in attempts to remove nitric oxide from exhaust gases by chemical reaction. Contact time of 0.8 sec allowed complete reduction of nitric oxide by activated carbon or by hydrogen on activated carbon at 600°-700°C. Products are nitrogen and carbon oxides or water.

Scaling Mesometeorological Phenomena. Edited by R. C. Wanta and H. Moses. (Lemont, Ill.: Argonne National Laboratory, 1958, June.)

Future requirements arising from expansion of both atomic energy and other types of industry gives evidence to need for information on mesometeorological processes. Use of modeling techniques offers an attractive possibility. Report of efforts of a group of individuals, who either have had broad experience with problems of modeling meteorological phenomena or who have made outstanding contributions in the field of micrometeorology, to judge the potentialities of modeling.

Appliances

The Importance of Gas Pressure, Especially of Methane, for the Functioning of the Consuming Apparatus. A. van der Linden. *Revista dei Combustibili 12,* 341 (1958) May (20 pp. Italian text.)

Main viewpoints concerning the selection of a suitable gas pressure wth regard to the operation of gas appliances are discussed. Function of gas pressure as a means of transport of gas and combustion products through the apparatus is examined, resulting in the conclusion that, in order to obtain comparable results for the gas appliances, the ratio of gas pressure of different kinds of gas ought to be proportional to the square of the Wobbe indices.

Clothes Dryers

What the Serviceman Should Know About Gas Clothes Dryer Controls. E. W. Wechsler. Part 1. Electric Ignition Controls. *Gas 34,* 51 (1958) July (5 pp.); Part 2. Standing Pilot Systems. *Ibid.,* (1958) Aug. (4 pp.)

Some dryers have a completely automatic electric ignition system and some incorporate a standing pilot. Both are similar in nature but vary considerably in servicing. Discussion of one basic system with some mention of variations which might be involved.

Combustion

Ideas and Observations About the Combustion Behavior of Gases. F. Schuster. *Brennstoff-Chemie 39,* 129 (1958) May 14 (6 pp. German text.)

Great demand for combustible gases has brought a new problem to science, namely the problem of interchangeability. Gas properties such as density, combustion velocity and heating value can be characterized by various test burners. For the determination of the quantitative relationship between the variables and the test burner indications, considerable experimental results are available which do not represent a final explanation but still give considerable insight into the behavior of mixed gases.

Some Recent Developments Concerning Free Radicals (A Review). G. J. Minkoff. *Combustion and Flame 2,* 193 (1958) June (15 pp.)

Status of knowledge of several of the smaller radicals and atoms is considered with particular reference to those which take part in combustion processes.

Tracer Studies on the Mechanism of Combustion of Carbon, Sulfur and Mercuric Sulfide. J. H. Wang and E. B. Fleischer. *J. Am. Chem. Soc. 80,* 3874 (1958) Aug. 5 (6 pp.)

Mechanisms of the reactions $C + O_2 \rightarrow CO_2$ and $S + O \rightarrow CO_2$, respectively, were studied with $O^{18}O^{18}$ as tracer. It was concluded that the two oxygen atoms in each CO_2 or SO_2 molecule produced came from different O_2 molecules.

Drying

The Magic Machine that Thinks. E. D. Lissner. *Ind. Gas 37,* 2 (1958) July (4 pp.)

Famatex oven-tenter is important feature of finishing department at New Jersey printing firm. Fired by gas, combustion system and controls are unusual. Essentially a series of semi-indirect radiant tube air heaters, machine consists of eight individually controlled sections ranging in temperature from 220°-400°F.

Flame Research

Effect of Pressure on Turbulent Burning Velocity. B. Fine. *Combustion and Flame 2,* 109 (1958) June (8 pp.)

Turbulent burning velocities were measured for three fuel oxidant systems over a range of pressures at nearly constant Reynolds number. Pressure exponent for turbulent burning velocity was consistently about 0.3 greater in magnitude than that for the corresponding laminar burning velocity. This result disagrees with the usual concepts of turbulent combustion; disagreement probably is result of inadequate experimental method.

Investigations on the Inflammability Ranges of Methane-Air and Butane-Air Mixtures Ignited by Electric Sparks. G. Dalmai. *Combustion and Flame 2,* 171 (1958) June (10 pp.)

Tentative explanation of the two-lobed shape of the inflammability ranges of a number of hydrocarbons is given in terms of two sets of phenomena: 1) the apex lying between the two lobes is conditioned by flame quenching mainly caused by vibrations of the flame propagating inside a closed tube and 2) the "second region" of the inflammability range.

Measurement of Flame Speeds by a Nozzle Burner Method. C. Halpern. *J. Research 60,* 535 (1958) June (12 pp.)

Report of progress made since 1951 description of equipment for measuring flame speeds. Article presents values of flame speeds of methane-air mixtures obtained since then, together with comparisons of these values with those obtained by two flame theories.

Separation of the Products of Cool Flame Oxidation of Propane. C. R. Yokley and R. E. Ferguson. *Combustion and Fuel 2,* 117 (1958) June (12 pp.)

Techniques of gas chromatography and low temperature, low pressure distillation have been applied to separation and isolation of major products of cool flame oxidation of propane. Methods described are adequate for separating and handling reaction products in small amounts without appreciable contamination. Data on column performance are presented.

Furnaces

Automatic Control of Gas-Fired Furnaces. L. Walter. *Gas World 148,* 8 (1958) July 19 (2 pp.)

Article indicates it is safe to assume that gas-fired furnaces are much easier to control than electric furnaces, although it is essential to coordinate all units of the heat flow process such as gas piping, throttle valves, gas burners, furnace chamber and many more.

Heat Treating

Automatic Austempering Unit Speeds Electric Typewriter Parts Production. R. S. McFall and C. A. McFadden. *Am. Gas J. 185,* 31 (1958) Aug. (4 pp.)

Integrated, multiple stage heat-processing machine austempers electric typewriter type bars to uniform metallurgical characteristics and close dimensional accuracy at high production rates and without rejects while reducing manpower requirements 40%. Each type bar is heated to 1550°F in 25 sec in a high temperature furnace fitted with Duradiant burners in the outer refractory wall, after which the bar is dropped into a salt quench furnace.

Heat Processing Ferrous Metals Under Controlled Atmosphere Conditions. L. A. Lush. *Gas J. 295,* 67 (1958) July 2 (11 pp.)

Description of clean and bright heat treatment processes with details of the metallurgical effect (variation of surface composition by increasing or decreasing proportions of a constituent, e.g. carbon within the metal). Article discusses how carburizing, decarburizing and nitriding may be brought about by varying the atmospheric conditions.

Magnesium Sand Castings; Heat Treating by Gas. H. Apthorp. *Ind. Gas 37,* 8 (1958) July (2 pp.)

Use of CO_2 atmosphere has many advantages and also allows use of same oven for aluminum.

Temperature Uniformity in Heat Treating Furnace. F. C. T. Daniels and S. Stasko. *Ind. Heating 25,* 1342 (1958) July (3 pp.)

New combination process for maintaining temperature control and uniformity in heat treating furnaces involves a different approach to the placement of burners and to their method of firing. Article describes combustion system.

Unique Heat Treating Fixture Solves Two Problems. *Ind. Gas 37,* 10 (1958) July (3 pp.)

High alloy cast fixture of articulated design enables engineers to heat treat large numbers of parts in single cycle and get longer life from a fixture exposed to corrosion, temperature swings and heavy loads.

Inert Gases

Production and Use of Hydrogen and Dissociated Ammonia Atmospheres for Sintering of Powdered Metals. M. R. Cole. *Ind. Heating 25,* 1356 (1958) July (5 pp.)

Production of hydrogen and ammonia base atmospheres and their role in the sintering of powdered metals are discussed.

LPG

Crop Dryers Mean Big Profits for Farmers and LPG Dealers. H. P. Behlen. *Butane-Propane News 20,* 43 (1958) Aug. (4 pp.)

Directed toward LPG dealers, article cites nine facts this group should know about drying farm crops with propane. Among these: portable farm crop dryer provides one of the fastest growing off-season markets for LPG; production of grain dryers has more than doubled in the past four years; during fall of 1957, many farm crop dryers used as much as 10,000 gal of propane each and propane is almost always used for portable dryer fuel because it does a better job at less cost.

Pipe Plant Increases Efficiency with LP-Gas Carburetion. D. Reber. *LP-Gas 18,* 34 (1958) Aug. (2 pp.)

Two years ago, U. S. Pipe and Foundry Co. converted its plant vehicles—cranes, lift trucks and platform trucks—from gasoline and electricity to LPG motor fuel. Reasons: high maintenance costs and excessive downtime. Today company finds that LPG has cut maintenance overhead, thus increasing production efficiency.

Ore Reduction

R-N Direct Reduction Process. A. Stewart and H. K. Work. *J. Metals 10,* 460 (1958) July (5 pp.)

Republic Steel and National Lead have combined forces to produce a direct reduction process specifically adapted to U. S. ores, both high and low grade. Objectives: to pilot the process on a sufficiently large scale so that results can be scaled up to full size plant; to produce sufficient material to allow blast furnace, open hearth and electric furnace tests; to study various ores and carbonaceous reductants available in the U. S.

Refrigeration

The Gas Refrigerator, 1958. Information on the Market Situation and Technical Progress. W. Schirp. *Gas. u-Wasserfach 99,* 601 (1958) June 20 (9 pp. German text.)

Drop in production of gas refrigerators in Germany from 1950-55 was partially due to competition of electrical appliances as well as difficulties arising from patent rights from absorption refrigerators. Situation has changed because of technical improvements in the burner (Schlepel-burner), addition of a thermostat and a pressure-regulating device and higher cooling efficiency. Development of absorption refrigerators has brought an increase in sales both domestic and foreign (e.g., Austria, Sweden, Denmark and Switzerland). Comparison of the economy of various sizes of domestic refrigerators, (both absorption and compression) is tabulated.

Burners

Burner. H. B. Snyder. U.S. 2,843,197 (1958) July 15.

Built up on the outlet of an air blower, this burner provides a carbureting chamber fed by liquid fuels, with a central electric-spark igniter placed downstream of the fuel-air orifices. The whole unit is designed for preheating a medium in a heat exchanger.

Gas Burner Apparatus for Forming Glass Fibers. G. de Piolenc and C. J. Stalego (assigned to Owens-Corning Fiberglas Corp.) U.S. 2,841,213 (1958) July 1.

Improved burner is claimed for production of fibers of glass or mineral wool, which comprises a double-walled combustion chamber, with liquid fuel or gas under pressure introduced into the outer annulus passing through a porous inner wall to meet liquid oxygen to yield a high velocity flame of 3000°-5400°F.

Gas Burner Heads. R. D. Reed (assigned to John Zink Co.) U.S. 2,840,152 (1958) June 24.

Burner head is claimed which stabilizes a high pressure gas flame by means of a conical shield which controls amount of secondary air drawn toward the flame ports, and with flame ports disposed at different angles.

Heat Treatment

Method of Relieving Bauschinger Effect in Oil Well Drill Pipe. J. W. Lodge (assigned to Youngstown Sheet and Tube Co.) U.S. 2,843,512 (1958) July 15.

Method is claimed for restoring the elastic limit and yield strength of drill pipe which has been reduced due to Bauschinger effect caused by cold plate deformation during drilling, which comprises heat treating the pipe for one hour at 850°F.

Pilot Lights

Combustion Apparatus Having Pilot Burner with Booster. C. C. Cipriani and K. K. Urbaschek (assigned to Surface Combustion Corp.) U.S. 2,843,-107 (1958) July 15.

Pilot burner is claimed for producing a flame in the remote interior of a furnace combustion chamber such as a hairpin radiant tube, with the pilot fuel supply drawn from the fuel manifold by suction on the radiant tube, and so controlled by size of orifice to maintain a near-atmospheric pressure on the pilot gas mixture.

Refrigeration

Absorption Refrigeration. W. G. Kogel and A. G. Hellstrom (assigned to Aktiebolaget Elektrolux.) U.S. 2,842,943 (1958) July 15.

Improved method is claimed for adjusting concentration of refrigerant in the absorption liquid

circuit, which is less sensitive to changes in level and to quantity charged.

Absorption Refigeration Systems. L. H. Leonard, Jr. (assigned to Carrier Corp.) U.S. 2,840,997 (1958) July 1.

Improved absorption refrigeration equipment is claimed wherein the weak solution ejector is replaced by a pump thereby reducing the noise of flashing and eliminating superheat in the strong solution.

Water Heater

Midget Gas Fired Hot Water Boiler. H. S. Ackerman (assigned to J. F. Baier.) U.S. 2,841,124 (1958) July 1.

Improved compact small-sized water heater is claimed, comprising horizontally placed coils of finned tubes (of downward converging crossection) in parallel staggered superimposed arrangement.

10. EQUIPMENT AND INSTRUMENTATION

Automation

Electro-Hydraulic Control . . . How Well Does It Work? C. D. Gingrich. *Petrol. Eng. 30,* C-6 (1958) Aug. (5 pp.)

First application of all-electronic instrumentation to a fluid catalytic cracking unit was made at 25,000 bbl/day Port Credit, Ontario, refinery. On-stream since late last year, operating experience at the new 7000 bbl/day cracking unit and its auxiliary processing sections have caused company to feel that electronic instrumentation has many advantages. Review of experiences.

Unattended Liquids Recovery Unit Onstream. W. T. Lawler. *Petrol. Eng. 30,* C-16 (1958) Aug. (2 pp.)

Sun Oil Co. needed additional refrigeration in order to improve dehydration efficiency while continuing to operate with good liquid extraction efficiency. Solution was found in designing for automatic operation with sequential startup and shutdown instrumentation.

Computers

Designing for Electronic Data Processing. E. J. Ross. *Gas Age 122* (1958) July 10 (5 pp.)

Although equipment development has broadened the critical limits of temperature and humidity in operation of electronic data processing equipment, building design must still take into consideration the special requirements of this type of apparatus. Article describes needs and way in which the Pacific Gas and Electric Company provided for installation of such equipment.

Diesel Engines

Development of a Test Code and Correction Factors for Diesel Engines—A Progress Report. A. K. Blackwood and M. A. Elliott. New York: Society of Automotive Engineers, Inc., (1958) June Preprint Paper 64B.; **Correction Factors Sought for Diesel Engine Test Code.** *S.A.E. J. 66,* 107 (1958) July (2 pp.)

Tentative draft of the revised SAE Diesel Engine Test Code, last revised in 1941, and a progress report of the code development and the correction factors for power output are presented for discussion. Code is to be the standard on dynamometer laboratory methods for determining performance characteristics of industrial engines, and presents the purpose, scope, terminology, test equipment and procedures. Progress report indicates reasons behind code provisions, and problems in developing correction factors for power output under varied ambient conditions.

Electricity

Maintenance of Electrical Economy in the Gas Making Process. T. Bryan. *Gas World 148,* 164 (1958) July 26 (7 pp.)

Survey of the developments being undertaken in the Birmingham Division of the West Midlands Gas Board to provide an effective and reliable electrical service to the gas-making process in five gas works producing about 30,000 million CF/year. Consideration is given to means of achieving reduction in material costs and to methods of installing equipment to the highest standard of electrical installation. Application of a planned maintenance system to such installations is discussed and reference is made to training of craftsmen and operators.

Pilot Plants

Keys to Pilot Plant Success. E. L. Clark. *Chem. Eng. 65,* 119 (1958) July 28 (4 pp.)

Equipment and safety are essential to success of pilot plant operations. Six-point check list will enable minimization of delays, breakdowns and accidents.

Piping

Portable Pipe Rack for Field Use. *Gas Age 122,* 30 (1958) July 10 (2 pp.)

Portable pipe rack holds 20 lengths of 24-in. pipe on first storage tier, 19 lengths on second tier. With seven additional lengths on third tier, total pipe storage held by the rack in one application weighed approximately 230,000 lbs and measured 1840 ft.

Pulverized Coal Transport through Pipes. R. C. Patterson. *Combustion 30,* 47 (1958) July (11 pp.)

Central stations and large industrial power plants are aware of troubles and dangers from furnace puffs and burner fires. Their ultimate solution can come only from fundamental study. Report of one such study involving such items as performance of commercial exhausters, friction factors for pipe, flow characteristics, coal drifting and air flow measurements of coal-air mixtures.

Requirement and Production of Welded Steel Pipe for Pipeline. K. Wallmann. *Erdöl u. Kohle 11,* 244 (1958) Apr. (4 pp. German text.)

Various types of steel which are used for pipelines today are named and their different properties discussed. Tensions which occur during pipeline manipulation are analyzed and methods of manufacturing are illustrated.

Process Design

Engineering a Process with a Computer. M. G. Kesler and M. M. Kesler. *World Petrol. 29,* 60 (1958) July 15 (4 pp.)

Segments of refinery processes have been programmed for a computer so that they may be used independently to solve local problems or integrated in any desired combination into a master program embracing a complete process design. Result is that optimum conditions can be established for the proposed process in a very few days.

Steam Generation

Central Station Control — Today and Tomorrow. W. A. Summers. *Combustion 30,* 34 (1958) July (9 pp.)

Philosophical probe into future evaluates the effects of current trends in terms of safety and "cost of errors", investment cost, fuel, fuel costs, and labor. Included is a projection of tomorrow's system based on the status quo.

11. MATERIALS OF CONSTRUCTION, AND CORROSION

Cathodic Protection

Aramco Protects Middle East Pipe Lines. E. G. Peattie. *Pipe Line Ind. 9,* 42 (1958) Aug. (5 pp.)

Soil resistances on Aramco's pipeline system vary from 800,000 ohm-centimeters to as low as 5 ohm-centimeters. In desert areas lines pass through depressions called sabkhas where highly saline waters are at or near the surface. In addition, much of the system is in coastal water of the Persian Gulf. Aramco is solving their corrosion problems using rectifiers, magnesium anodes, diesel generators, welding machines and a windmill.

Note on the Rate of Evolution of Hydrogen at a Magnesium Anode. J. H. Greenblatt. *Can. J. Chem. 36,* 1138 (1958) Aug. (3 pp.)

Recent work on the mechanism of the anodic dissolution of magnesium is reviewed and additional data on the temperature dependence of the rate of hydrogen evolution at magnesium anodes during electrolysis are given. It is concluded that results obtained and literature on this subject are explained more logically by a kinetic mechanism involving initial solution of a univalent magnesium ion followed by subsequent reaction of this ion with water than by postulating self-corrosion with hydrogen evolved at local cathodes.

Weather Versus Cathodic Protection of Underground Pipe Lines. F. E. Costanzo. *Corrosion 14,* 363t (1958) Aug. (6 pp.)

Comparison is made between weather data and cathodic protection survey data of a four-mile section of 20-in. bare pipeline in southwestern Pa. over a five-year period. Relationship between rectifier current output and rainfall, soil temperature and mean daily temperature are considered.

Zinc as a Cathodic Inhibitor. H. B. Jonassen. *Corrosion 14,* 375t (1958) Aug. (2 pp.)

Zinc metal in close contact with a noble metal such as silver furnishes zinc ions to an aqueous solution. Binuclear zinc hydroxide complexication seems to be formed which can act as a cathodic inhibitor. This ion also acts as a buffer removing CO_2 and it reacts with the oxygen in the water to give additional hydroxide ions.

Coatings

Asphalt-Type Protective Coatings for Underground Pipe Lines. *Corrosion 14,* 373t (1958) Aug. (2 pp.)

Recommended minimum characteristics of an asphalt wrapped underground pipeline coating system are given. Included are physical characteristics of primer, enamel and wrapping, testing methods for primer and enamel.

Corrosion

Longer Life for MEA Reboilers. L. Resen. *Oil Gas J. 56,* 82 (1958) July 21 (2 pp.)

Service life on one company's reboilers has been extended by effective removal of stagnant CO_2 pockets. Distribution of incoming stream across four inlet lines permits additional scrubbing action by the solution and dissipation of trapped CO_2. Meanwhile, the many openings at the top of the reboiler permit the CO_2 released within the reboiler

to escape and be carried back to the tower with the heated solution where it may escape up the column.

Magnetic Treatment of Liquids for Scale and Corrosion Prevention. T. Vermeiren. *Corrosion Tech. 5,* 215 (1958) July (5 pp.)

Magnetic fields may effect the behavior of dissolved matter as well as of crystalline matter; it is a logical conclusion that these fields could act during the reactions in which these matters take a part, and more particularly on corrosion and scale formation. Article discusses some technical results obtained with magnetic treatment of liquids against corrosion and scale formation. Treatment takes place in an apparatus in which a liquid circulates between powerful electromagnets or permanent magnets, and which may be compared to a dynamo in which the stator is the magnet and the rotor the liquid.

Methods of Fighting Corrosion. J. S. Connors and C. L. Seyer. Part 1. *Oil Gas J. 56,* 93 (1958) July 21 (4 pp.); Part 2. *Ibid.,* 176 (1958) July 28 (3 pp.)

Rate of corrosion in amine-treating units can be minimized by process design changes to prevent high temperature and oxygen degradation of amine by use of reclaimers and by stress relieving of key equipment. Part 2 discusses six ways to fight corrosion: inhibitors, replacement, process changes, special design, zinc-dust coatings and cathodic protection.

The Present Status of the Oil Ash Corrosion Problem. *Corrosion 14,* 369t (1958) Aug. (4 pp.)

Unusually severe corrosion has been reported in systems burning residual fuel. This has been attributed to the high vanadium content of the oil, the sulfur content or the presence of sodium chloride. Five case histories involving failures in the field are reviewed with the objective of pointing out the characteristics of the problem.

Ultrasonic Inspection Used to Detect Hydrogen Attack. J. Bland. *Petrol. Ref. 37,* 115 (1958) July (4 pp.)

New test procedure involves ultrasonic testing techniques to reveal the effect of high temperature hydrogen attack on steel. Description of procedure details is given along with typical patterns for evaluating extent of attack.

You Can Stop Hydrogen Attack. W. A. Bonner. *Petrol. Refiner 37,* 111 (1958) July (4 pp.)

Air injection is the basis of Shell's new royalty-free process for preventing hydrogen blistering and fissuring if the refinery gas stream has a high pH and contains cyanides.

Corrosion Measurement

Corrosion Rates in Port Hueneme Harbor. C. V. Brouillette. *Corrosion 14,* 352t (1958) Aug. (5 pp.)

Corrosion rates of 16 metals and alloys were determined over a period of 30 months total immersion in the sea water at Port Hueneme, Calif. Lead evidenced least attack while magnesium alloys were most readily attacked. Corrosion rates in the harbor at Port Hueneme appear to be typical of the sea water along the California coast, aggravated to some extent by marine growth. Pitting was a major factor in the corrosion of aluminum, stainless steel and Monel.

The Distribution of Soil Conductivities and Some Consequences. G. N. Scott. *Corrosion 14,* 396t (1958) Aug. (5 pp.)

Discovery that the logarithms of soil conductivity are normally distributed in an impressive range of soils opens a new field of investigation for corrosion engineers and makes possible better engineering in soil corrosion mitigation. A number of practical applications of the relationship are discussed.

Insulation

Thermal Insulation for Nuclear Systems. C. G. Collins and G. W. Pomeroy. *Heating, Piping & Air Conditioning 30,* 129 (1958) Aug. (6 pp.)

Considerations that radiation environment imposes on the selection of thermal insulation materials are discussed. These materials have received comparatively little attention to date since most existing reactors are of a research type in which thermal efficiency is of minor importance. However, thermal insulation will be an important material as nuclear industry strives to become economically competitive with other power sources.

Vapor Problems in Thermal Insulation. N. B. Hutcheon. *Heating, Piping & Air Conditioning 30,* 150 (1958) Aug. (3 pp.)

Control of water vapor flow to avoid condensation can be achieved in many applications of thermal insulation. Such control is needed for the proper functioning of thermal insulation and in order to avoid excessive deterioration of the adjacent construction as a result of wetting.

Plastics

Plastic Pipe . . . Characteristics and Applications of Four Principal Types. H. M. Englund. *Air Conditionng, Heating and Ventilating 55,* 67 (1958) Aug. (12 pp.)

Report deals with specifics concerning four types of plastic pipe (polyvinyl chloride, polyethylene, acrylonitrile-butadiene-styrene, cellulose acetate butyrate) commercially available; how to select them, where to use them and how to work with them.

Plastic Repair May Solve Leak Problems. *Oil Gas J. 56,* 97 (1958) July 21 (2 pp.)

Case histories of the application of plastic to tanks, naphtha line, centrifugal pump and sump pump for repair jobs.

Welding

New Concept Solves Aluminized Pipe Weld Problems. K. R. Notvest. *Petrol. Refiner 37,* 100 (1958) July (3 pp.)

Controlling the fusion of aluminized base metal with filler material gives an alloyed root pass, thereby enabling successful welding of aluminized pipe. Alloyed root pass is fused to the base metal coating, thereby providing continuous protection from corrosion.

Metals

Production of Nickel or Iron Powder. D. M. Llewelyn, A. B. Simpson and D. H. West (assigned to International Nickel Co., Inc.) U.S. 2,844,456 (1958) July 22.

Light fibrous "Type B" nickel or iron powders of low sintering shrinkage are produced by decomposing the carbonyls thermally in the presence of 0.02-0.06% of oxygen and 30-40% by volume of carbon monoxide.

12. ANALYTICAL METHODS AND TESTS

Alcohols

A New Mass Spectrometric Method for Determining Alcohols and Water in Complex Mixtures. The Fischer-Tropsch Product. S. H. Langer, R. A. Friedel, I. Wender and A. G. Sharkey. *Anal. Chem. 30,* 1353 (1958) Aug. (4 pp.)

Alcohols are measured by direct mass spectrometric procedure after being converted to trimethylsilyl ethers with hexamethyldisiloxane. Paraffins, olefins and other hydrocarbons do not interfere. Water reacts to form hexamethyldisiloxane having a distinct 147 mass spectral peak. Procedure is applicable to determination of glycols, amines and phenols.

Aromatics

Mass Spectra of Aromatic Hydrocarbons Filtered from Smoky Air. F. L. Mohler, P. Bradt and V. H. Dibler. *J. Research 60,* 615 (1958) June (4 pp.)

Aliphatic and aromatic hydrocarbons have been analyzed by two methods: 1) slow evaporation of the sample from a tube furnace directly into the mass spectrometer, with the spectra recorded as the temperature is increased, and 2) complete vaporization of the sample in a heated reservoir, with the vapor passed through a leak into the mass spectrometer. Mass spectra of the aromatic fractions evaporated from the tube furnace show sharply defined fractionation with molecule ions of fused-ring aromatics predominant. Compounds containing three to seven fused rings are tentatively identified.

A Rapid Method for the Determination of the Aromatic Contents of Petroleum Fractions Boiling above the Kerosene Range. B. M. Brook and B. T. Whitham. *J. Inst. Petrol. 44,* 212 (1958) July (4 pp.)

Rapid, small-scale elution chromatographic procedure was developed for separation and determination of saturates and aromatics in olefin-free fuels and oils by selective adsorption on silica gel. Simple filter paper spotting technique was used to follow the separations, and results obtained for a number of oils and blends were compared with those from an established chromatographic method.

Benzene

The Formation of Benzene in the Pyrolysis of Acetylene. W. W. Robertson, E. M. Magee and F. A. Matsen. *J. Appl. Chem. 8,* 401 (1958) July (2 pp.)

Facts related to benzene formation in the pyrolysis of acetylene are reexamined. Preponderance of evidence from many sources makes the presence of benzene in the products of decomposition almost certain. It is pointed out how the benzene spectrum may be overlooked in the ultraviolet region unless care is taken to remove strongly absorbing materials that mask its presence.

Chromatography

Continuous Separation of Gases with a New Method of Countercurrent Stream Distribution. H. Pichler and H. Schulz. *Brennstoff-Chemie 39,* 148 (1958) May 14 (6 pp. German text.)

Principle of continuous gas separation by means of countercurrent stream distribution (continuous gas chromatography) is presented and its special application for the separation of very similar undecomposed volatile materials is illustrated.

Gas Chromatography — Powerful New Tool for Chemical Analysis. H. H. Hausdorff and N. Brenner. **Part 1.** *Oil Gas J. 56,* 73 (1958) June 30 (3 pp.); **Part 2.** *Ibid.,* 122 (1958) July 14 (4 pp.); **Part 3.** *Ibid.,* 86 (1958) July 21 (3 pp.); **Part 4.** *Ibid.,* 89 (1958) Aug. 4 (6 pp.)

Vapor chromatography is reviewed as instrumentation based on adsorption and partition principles. It provides excellent analytical results for gases and liquids with boiling points as high as 400°C. Newly developed commercial instrument for chemical analysis is based on elution-partition chromatography

and is designed to use adsorption columns. Six variables must be considered for effective gas chromatography. An ideal eight-component mixture was used to establish effect of these variables on running speed, obtainable separation and accuracy of quantitive determination. Advantages of gas chromatography analysis include low cost, simplicity of equipment and interpretation, minimum component interference and small required samples.

Gas-Liquid Chromatographic Analysis Applied to Air Pollution. Sampling. P. W. West, B. Sen and N. A. Gibson. *Anal. Chem. 30,* 1390 (1958) Aug. (8 pp.)

General method for detection, determination and isolation of individual organic compounds in the atmosphere is developed using gas-liquid chromatography. Air samples are passed over a bed of cold activated charcoal prior to chromatography. Method operates at 80% efficiency with a detection range between 1 and 50 ppm.

Low Pressure Electric Discharge Detectors. R. C. Pitkethly. *Anal. Chem. 30,* 1309 (1958) Aug. (6 pp.)

Low pressure electric discharge device of Harley and Pretorius is made stable and sensitive by using a homogeneous, nonsputtering cathode and a small anode-cathode spacing. Device is applicable as a detector in gas chromatography and is capable of analyzing gaseous or gas-liquid mixtures in quantities between the microgram and millimicrogram levels.

Gas Analysis

Progress Review No. 44: Sampling, Analysis and Testing of Gaseous Fuels. G. R. Boreham. *J. Inst. Fuel 31,* 304 (1958) July (4 pp.)

Review of literature published during the eight-year interim since the last progress report includes fields of chromatography techniques, infrared spectroscopy, chemical analyzers, standards, sampling and determination of individual components.

Heat Capacity

He^3 Cryostat for Measuring Specific Heat. G. Seidel and P. H. Keesom. *Rev. Sci. Instruments 29,* 606 (1958) July (6 pp.)

Apparatus with a bath of liquid He^3 as a coolant has been developed for measuring specific heats below 1°K. Temperatures as low as 0.30°K can be maintained for long periods of time. Description of a simple thermal switch also is included.

Methane

Determination of Low Concentrations of Methane in Coal-Mine-Air Samples by Infrared Absorption Spectrometry. P. J. Colbassani and H. A. Watson. Washington, D.C.: U.S. Bur. Mines Circ. 7829 (1958).

Circular describes conditions under which infrared absorption spectrometry may be used to identify and determine methane accurately without interference from low concentrations of other gases that might be present in coal-mine air.

Petroleum Properties

Ring Analysis Diagrams for the Saturated Mineral Oil Fractions. J. Cornelissen, J. A. Waterman and H. I. Waterman. Part. 2. *Brennstoff-Chemie 39,* 141 (1958) May 14 (5 pp. German text.)

Description of the ring analysis diagrams for saturated mineral oil fractions which represent a chart of several physical constants vs the index of refraction or the density. It was previously published that certain physical constants such as the index of refraction, n, the density, d, the ultrasonic velocity, u, the surface tension, σ, and the verdet constant, V, reach the same limit for the various homologs of the hydrocarbons. This is not true for the viscosity, v, which reaches an infinite limit. Importance of limits for the construction of the above-mentioned diagrams is pointed out. Results obtained indicate that it is not permissible to state that the ring number R_N can be derived from two arbitrary physical constants.

Phenols

Identification and Determination of Low-Boiling Phenols in Low Temperature Coal Tar. C. Karr, Jr., P. M. Brown, P. A. Estep and G. L. Humphrey. *Anal. Chem. 30,* 1413 (1958) Aug. (4 pp.)

Vapor phase chromatographic method to determine low-boiling phenols in low-temperature coal tar distillate is more simple and direct than conventional infrared analysis. Comparative study involves phenols, cresols, xylenols and ethylphenols. Disadvantage in the vapor phase method is the difficulty of resolving certain phenols having similar partition coefficients.

Radioactivity Applications

Hydrogen Bomb Tritium as Indicator for Compressed Water in Secondary Oil Production. H. V. Buttlar. *Erdöl u. Kohle 11,* 376 (1958) June (3 pp. German text.)

Tritium concentration of rain and river water has been increased by the hydrogen bomb explosions in the past years. If recent river water is forced into the well for secondary oil production, it can be determined by a single test on the tritium content whether oil-water or river water is being pumped. Advantages: 1) longer half-life; 2) practically no radiation danger; 3) low absorption in mountains, and 4) no cost, because of the hydrogen bomb explosions. Disadvantage: complicated determination procedure for tritium.

Surface Area

Determination of Surface Area. Adsorption Measurements by a Continuous Flow Method. F. M. Nelsen and F. T. Eggertsen. *Anal. Chem. 30,* 1387 (1958) Aug. (4 pp.)

Thermal conductivity measurements using a recording potentiometer make the determination of surface area by the liquid nitrogen adsorption method faster and simpler. Known amount of nitrogen is passed through the sample, the effluent being continuously monitored by a thermal conductivity device. Method compares favorably with pressure-volume procedure.

Temperature Measurement

Emission and Absorption Studies of Hydrocarbon Combustion Products. *Nat. Bur. Standards Tech. News Bull. 42,* 139 (1958) July (2 pp.)

In some regions, (jet engine and gas turbine exhaust temperatures) measurements of intensity may be used to determine temperature on the basis of a previous intensity-temperature calibration for the spectral interval. Study indicates feasibility of such a temperature determination.

Energy Distributions and Temperature Determinations in Flames. *Nat. Bur. Standards Tech. News Bull. 42,* 131 (1958) July (3 pp.)

In using observed distribution of molecules in possible energy states to study rate processes and equilibrium conditions, three general types of behavior are found. Essentially they differ in the amount of interaction between the various groups of energy states in the system being observed. Examples of each type, strong, partial and no interaction, are discussed.

Temperature Measurement in Solids. W. H. Giedt and D. L. Rall. *Product Eng. 29,* 65 (1958) July 21 (3 pp.)

Increased operating temperatures in highly stressed materials call for knowing the exact temperature at the exact point. Comparison of the effectiveness of thermistors, thermocouples and resistance elements is included.

Water

Determination of Traces of Water in Hydrocarbons in Gasoline Boiling Range. Sample Handling and Interferences. J. W. Loveland, T. B. Webster, C. P. Hablitzel and G. W. Reed. *Anal. Chem. 30,* 1316 (1958) Aug. (6 pp.)

Water content (10-50 ppm) of naphtha is accurately determined by titrating with Karl Fischer reagent. Special technique for handling sample eliminates error due to absorbed and atmospheric oxygen. Interference of mercaptans (over 10 ppm) can be calculated and final water content value adjusted accordingly.

Temperature Measurement

Apparatus for Measuring the Temperatures of Gaseous Fluids and in Particular Flames. A. G. L. Moutet (assigned to Office National d'Etudes et de Recherches Aeronautiques.) U.S. 2,843,008 (1958) July 15.

Temperatures of gaseous flames are measured by comparison of identical radiation beams from a controllable radiant source. One beam passes through the flame and the other forms a comparison beam, the energies of both being converted to electric voltage for easy comparison, and then recorded to enable calculation of energy absorption by flame according to Kirchoff's law.

13. BASIC SCIENCE

Adsorption

Cleanup of Atomic Hydrogen. K. B. Blodgett. *J. Chem. Phys. 29,* 39 (1958) July (5 pp.)

When hydrogen is dissociated by an incandescent tungsten filament in a glass tube, some of it is cleaned up if the tube is cooled in liquid air. Amount cleaned up can be greatly increased by coating the inner wall with mercury or copper. In one experiment, amount of cleanup in cold mercury was equivalent to 14 monolayers of atomic hydrogen. Cleanup proceeded at a diminishing rate until pressure fell to the value at which hydrogen left the mercury as fast as it entered.

Carbon Dioxide

Flow of Two-phase Carbon Dioxide through Orifices. J. C. Hesson and R. E. Peck. *J. A.I. Ch. E. 4,* 207 (1958) June (4 pp.)

Experimental flow rate data are presented for saturated liquid, saturated vapor and two-phase liquid-vapor carbon dioxide through a convergent nozzle and a square-edge orifice. Data cover the range from the triple-point pressure to the critical pressure. Charts have been prepared for this complete range at critical flow. Results also are presented for subcritical flow.

Packed Column Performance of Carbon Dioxide—Monoethanolamine System. A. J. Teller and H. E. Ford. *Ind. Eng. Chem. 50,* 1201 (1958) Aug. (6 pp.)

Flow pattern effects due to packing geometry as well as inherent packing surface make a significant contribution to mass transfer efficiency. Three commercial packings were evaluated in a tower of 8 in. diam. for absorption of carbon dioxide (8-12% by volume) from air by 18-20% monoethanolamine in water solutions. Liquid flows were varied and mass transfer efficiencies of ceramic Berl saddles and steel Raschig rings were equal.

Catalysis

Infrared Spectra of Chemisorbed Molecules. R. P. Eischens. *J. Chem. Education 35,* 385 (1958) Aug. (5 pp.)

Review deals with spectra of carbon monoxide chemisorbed on platinum and unsaturated hydrocarbons chemisorbed on nickel. Work on these chemisorption systems was undertaken because of their importance in fundamental catalyst research.

Coal Properties

The Infra-red Spectra of Coal and Some Coal Derivatives. W. den Hartog and N. Berkowitz. *Fuel 37,* 253 (1958) July (19 pp.)

Infrared spectra of three Western Canadian coals and of a series of solvent extracts, humic acids, humates and pyridine-extract fractions are reported. Spectra were determined in order to assess more closely the applicability of infrared spectroscopy to coal-like materials and to explore the possibility of establishing some unifying characteristics of solvent extracts, but were generally found to be so diffuse as to render detailed analysis impossible.

Optical Properties of Graphite and Coal. J. T. McCartney and S. Ergun. *Fuel 37,* 272 (1958) July (11 pp.)

Optical constants of different coals have been determined in a similar manner, and their variation with metamorphism and approach to those of graphite have been studied. An approximate linear relationship has been found between log reflectivity and hydrogen/carbon ratio. A similar relation has been observed between absorption index and hydrogen/carbon ratio, whereas the variation of refractive index with metamorphism was small. Absorption index was found to be a sensitive criterion of structural variations in graphite and coal.

Diffusion

Calculation of the Diffusion Coefficient of Dilute Gases and of the Self-diffusion Coefficient of Dense Gases. J. C. Slattery and R. B. Bird. *J. A.I.Ch.E. 4,* 137 (1958) June (6 pp.)

Corresponding-states correlation of low-density binary- and self-diffusion coefficients is presented. Equations are simple to use, sufficiently accurate for most calculations, and correlate those data used in their derivation somewhat better than calculations based on the Lennard-Jones potential if potential parameters have to be estimated from the critical properties. The Enskog kinetic theory of dense gases is used in modified form to obtain an expression for the high-density diffusion coefficient for isotopic mixtures in terms of viscosity and compressibility of the gas.

Diffusion of Gases in Porous Media. R. F. Dye and J. M. Dallavalle. *Ind. Eng. Chem. 50,* 1195 (1958) Aug. (6 pp.)

Diffusional characteristics of porous media are of practical as well as theoretical interest. Information and data on diffusion rates in porous materials are important, particularly in catalysis and adsorption where over-all kinetics or adsorption rates may be entirely controlled by the diffusional characteristics of the system.

Fluid Flow

Mixing of Fluids Flowing through Beds of Packed Solids. E. A. Ebach and R. R. White. *J. A.I.Ch.E. 4,* 161 (1958) June (9 pp.)

Study was conducted to extend limited data and to investigate thoroughly the axial mixing of liquids flowing through fixed beds of solids. Variables which were investigated included fluid velocity, particle diameter, particle shape and liquid viscosity.

Velocity Profile for Fully Developed Turbulent Flow in a Pipe. T. J. Hanratty and D. L. Flint. *J. A.I.Ch.E. 4,* 132 (1958) June (5 pp.)

An equivalent Poiseuille's Law is derived for a homogeneous isotropic turbulent field. Derivation is based on an analogy between momentum transfer and heat and mass transfer, three coefficients being used to characterize the exchange process: 1) molecular viscosity μ, 2) intensity parameter to characterize magnitude of turbulent velocity fluctuations v^2, and 3) a scale parameter to characterize the scale of turbulence r.

Wall Effect for the Fall of Single Drops. J. R. Strom and R. C. Kintner. *J. A.I.Ch.E. 4,* 153 (1958) June (4 pp.)

Measurements were made of the rate of fall of drops of five organic liquids through an aqueous phase contained in eight vertical cylinders of various diameters. Newton's equation for the wall proximity effect for rigid spheres or cylinders predicts values somewhat in excess of the observed. A correction factor equation with the more convenient equivalent spherical diameter is presented.

Fractionation

Packed Fractionating Columns. S. R. M. Ellis and J. Varjavandi. *Chem. Process Eng. 39,* 239 (1958) July (5 pp.)

Recent years have witnessed considerable advances in tower packings field and, in addition to a variety of ring packings, etc., numerous gauze packings now are available. After a brief general survey of packings and of the effect on column efficiency of liquid distribution and wetting characteristics, article discusses gauze packings and compares various types from the point of view of pressure drop and other factors.

Heat Transfer

Development of the Calorimeter Heat Transfer Gauge for Use in Shock Tubes. P. H. Rose. *Rev. Sci. Instruments 29,* 557 (1958) July (8 pp.)

Heat transfer gauge for measuring extremely high heat transfer rates under the quasi-transient conditions occurring in shock tubes is based on a calorimetric principle and is made possible by the short steady-state times inherent in shock tubes. Operating principles and experimental experiences are reported.

Recent Advances in Convective Heat Transfer with Dissociation and Atom Recombination. D. E. Rosner. *Jet Propulsion 28,* 445 (1958) July (7 pp.)

Energy transfer to surface of a vehicle depends critically upon whether the atoms or molecular fragments recombine exothermically in its immediate vicinity, at the surface of the body itself, or in the wake left by the vehicle. Thus, net energy transfer depends upon flight conditions, surface conditions and physical scale in a way which could not be anticipated without making a detailed study of energy transfer processes in nonuniform, reacting gaseous mixtures.

Hydrocarbons

Applied Hydrocarbon Thermodynamics. W. C. Edmister. Part 6. Improved Mollier Charts for Hydrocarbons. *Petrol. Refiner 37,* 195 (1958) June (4 pp.); Part 7. Isentropic Exponents for Gases. *Ibid.,* 153 (1958) July (10 pp.)

Full-page charts for methane, ethylene, ethane, propylene, propane, *i*-butane, *n*-butane, and *n*-pentane are presented in Part 6. Generalized charts for isentropic exponents are given in Part 7, along with all necessary thermodynamic properties of gases for the calculations.

Hydrogen

The Rate of Electrolytic Hydrogen Evolution and the Heat of Adsorption of Hydrogen. R. Parsons. *Trans. Faraday Soc. 54,* 1053 (1958) July (11 pp.)

Relation between the exchange current for electrolytic hydrogen evolution and the ability of the electrode to adsorb atomic hydrogen is discussed. This relation is qualitatively the same for the three accepted partial reactions; i_o passes through a maximum for metals adsorbing hydrogen moderately. Once this relation is established, the complete current-voltage curve can be calculated for a metal, given the standard free energy of hydrogen adsorption on it.

Infrared Radiation

Far Infrared Transmission Through Metal Light Pipes. R. C. Ohlmann, P. L. Richards and M. Tinkham. *J. Optical Soc. Am. 48,* 531 (1958) Aug. (3 pp.)

Fractional transmission of far infrared radiation through metal light pipes is calculated and compared with experimental data. Transmission factors greater than 50% are obtained over distances of several feet with typical parameters. Condensing cones allow the output radiation to be concentrated onto a small detector area for spectroscopic applications.

Ion Exchange

Ion Exchange in Clay Minerals. C. B. Amphlett. *Endeavour 17,* 149 (1958) July (7 pp.)

Ion exchanges in clay minerals recently have become interesting in connection with the disposal of radioactive waste. Results obtained and methods used are described.

Osmionic Demineralization. G. W. Murphy. *Ind. Eng. Chem. 50,* 1181 (1958) Aug. (8 pp.)

Method of purifying water is promising for arid regions—power is derived from concentration differences between two streams of saline water. From calculations based on laboratory data, process is economically competitive with the best methods now available for brackish water demineralization. Principles and types of ionic cells are discussed from the standpoint of minimum product cost.

Kinetics

Kinetic Studies of Carbonation Reactions Using Radioactive Tracers. D. M. Himmelblau and A. L. Babb. *J. A.I.Ch.E. 4,* 143 (1958) June (10 pp.)

Radioactive tracer technique was used to determine kinetic reaction rate constants in the CO_2-$NaHCO_3$-Na_2CO_3-H_20 system at temperatures of 32°, 50° and 68°F., and at various values of *p*H ranging from 5.6-7.6. By operating with this system at chemical equilibrium but at isotopic disequilibrium, it was possible to divorce the influence of the diffusion of CO_2 into and out of the aqueous solution from the kinetic effects of the chemical reaction. Radioactive carbon -14 in the form of CO_2 was analyzed by means of the Bernstein-Ballentine technique in order to measure the rates of reaction.

Methane

Heterogeneous Phase Equilibria of the Methane-hydrogen Sulfide System. J. P. Kohn and F. Kurata. *J. A.I.Ch.E. 4,* 211 (1958) June (7 pp.)

Experimental apparatus and techniques which were developed to determine the heterogeneous phase behavior of the methane-hydrogen sulfide system have been tested and employed at temperatures in the range of -300° to 300°F and at pressures up to 2000 psi. Vapor-liquid, vapor-solid, liquid-solid, liquid-vapor-solid, liquid-liquid-vapor and liquid-liquid-solid phase border curves were determined for six mixtures of methane and hydrogen sulfide.

Organic Sulfur

Characteristic Vibrational Frequencies of Organic Sulfur Compounds. D. W. Scott and J. P. McCullough. *J. Am. Chem. Soc. 80,* 3554 (1958) July 20 (5 pp.)

Calorimetric and sprectroscopic data were used previously to make complete vibrational assignments for 10 organic compounds that contain only the CH_3S, C_2H_5S, $(CH_3)_2CHS$ and $(CH_3)_3CS$ groups. These assignments were used in calculating values of thermodynamic properties reported earlier. Current article discusses regularities found in the spectra of the 10 compounds. Characteristic fundamental frequencies of one alkyl group attached to sulfur are little affected by the nature of a second attached group. Incomplete vibrational assignments based on limited sprectoscopic data are given for five other sulfur compounds.

2,3-Dithiabutane, 3,4-Dithiahexane and 4,5-Dithiaoctone: Chemical Thermodynamic Properties from 0 to 1000°K. W. N. Hubbard, D. R. Douslin, J. P. McCullough, D. W. Scott, S. S. Todd, J. F. Messerly, I. A. Hossenlopp, A. George and G. Waddington. *J. Am. Chem. Soc. 80,* 3547 (1958) July 20 (8 pp.)

Thermodynamic properties of the first three members of the symmetrical alkane disulfide series were investigated. Measurements were made of the heat of vaporization and vapor heat capacity of 2,3-dithiabutane; the low temperature thermal properties, vapor pressure and entropy of 4,5-dithiaoctane; and the heats of combustion and formation of 2,3-dithiabutane, 3,4-dithiahexane and 4,5-dithiaoctane. Values of the heat free energy and logarithm of the equilibrium constant of formation between 0 and 1000°K were computed for the three compounds.

Photochemical Energy

The Mercury-Photosensitized Oxidation of Hydrocarbons. R. H. Burgess and J. C. Robb *Trans. Faraday Soc. 54,* 1015 (1958) July (11 pp.)

Method of determining the rate of a chemical reaction by measurement of the temperature rise in the gas on irradiation with 2537 A ultra-violet light is applied to an investigation of the chain oxidation of six hydrocarbons in the temperature range 0°-400°C. Rate of oxidation of the straight-chain paraffins is found to be independent of pressure while the other hydrocarbons show a dependence on the hydrocarbon pressure.

The Mercury-Photosensitized Hydrogen + Oxygen Reaction. R. H. Burgess and J. C. Robb. *Trans. Faraday Soc. 54,* 1008 (1958) July (6 pp.)

Method of investigation of the rate of a gas phase reaction by measurement of the heat liberated is applied to the mercury-photosensitized hydrogen + oxygen reaction over a wide temperature range. New reaction vessel has been developed to cope with this temperature range. Energy of activation of the chain reaction observed at room temperature is obtained. Chain branching necessary to produce explosion at the second explosion limit is determined.

Solid State Physics

Potential Applications of Solid-State Physics in Chemical Engineering. H. G. Drickamer. *Ind. Eng. Chem. 50,* 1023 (1958) July (2 pp.)

Solids may be classified in five types according to their macroscopic physical properties. The band theory and Heitler-London theory of solids are briefly outlined, and it is shown how solids can be classified as insulators, conductors or semiconductors.

Sulfur

Triatomic Linear Molecules Containing Carbon and Oxygen, Sulfur, Selenium or Tellurium. 1. Vibrational Spectra of CS_2, CSe_2, SCSe and SCTe. T. Wentink, Jr. *J. Chem. Phys. 29,* 188 (1958) July (13 pp.)

Vibrational infrared absorption spectra of the molecules CS_2, CSe_2, $SCSe_2$ and SCTe were recorded and analyzed. Some Raman data also are included.

Water

Apparatus for the Experimental Study of the Thermodynamic Properties of Water. H. H. Reamer, G. N. Richter, W. M. DeWitt and B. H. Sage. *Trans. A.S.M.E. 80,* 1004 (1958) July (5 pp.)

As part of an investigation of the properties of water at elevated temperatures and pressures, a study of the Joule-Thomson coefficient and the isothermal enthalpy-pressure derivative of steam has been undertaken. The experimental program reported is directed to the study of these coefficients at about temperatures between 400°-1500°F and at pressures up to 15,000 psi or to a specific weight of the fluid such that the coefficients approach the inversion point. Some measurements in the region of negative Joule-Thomson coefficient may be undertaken.

Methane

Methane and Carbon Dioxide Solutions in Hydrocarbons. J. W. Martin, F. A. Hessel, I. P. Hammer and J. B. Rust (assigned to Oil Recovery Corp.) U.S. 2,843,256 (1958) July 15.

Method is claimed of increasing the solubility of hydrocarbon gases such as methane and ethane in liquid petroleum hydrocarbons, by also dissolving CO_2 and maintaining a methane partial pressure of 50-1600 psi and a CO_2/CH_4 partial pressure ratio of 2:1-0.1:1.

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